

***NATIONAL WATER PROGRAM  
STRATEGY:  
RESPONSE TO CLIMATE CHANGE***

**KEY ACTION UPDATE  
FOR 2010-2011**



**Office of Water  
U.S. Environmental Protection Agency**

**August 2010**

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## List of Acronyms

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ACOE	Army Corps of Engineers
AEIO	American Indian Environmental Office
AMWA	Association for Metropolitan Water Agencies
ARRA	American Reinvestment and Recovery Act
AWWA	American Water Works Association
BECC	Boarder Environment Cooperation Commission
BPJ	Best Professional Judgment
C <sup>3</sup>	Climate Change Collaboration
CAA	Clean Air Act
CAFO	Concentrated Animal Feeding Operation
CASA	Conservation Alliance of Southern Arizona
C-CAWWS	Climate Change and Water Working Group
CCS	Carbon Capture and Sequestration
CCWG	Climate Change Working Group
CEQ	Council for Environmental Policy
CEU	Continuing Education Unit
CHP	Combined Heat and Power
CRE	Climate Ready Estuaries
CREAT	Climate Resilience Education and Awareness Tool
CRWU	Climate Ready Water Utilities
CUPSS	Check Up Program for Small Systems
CWA	Clean Water Act
CZARA	Coastal Zone Act Reauthorization Amendments
DI	Direct Implementation
DNR	Department of Natural Resource
DO	Dissolved Oxygen
DOE	Department of Energy
DOI	Department of the Interior
DWRP	Drinking Water Research Program
ECHs	Energy Conservation Measures
EMS	Environmental Management System
EO	Executive Order
EPRI	Electric Power Research Institute
ESRP	Ecosystem Services Research Program
GAP	General Assistance Program
GCCN	Global Climate Change Network
GCM	Global Climate Model
GHG	Greenhouse Gas
GLNPO	Great Lakes National Program Office

GPRA	Government Performance and Results Act
GRCP	Global Change Research Program
GS	Geological Sequestration
HSPF	Hydrologic Simulation Program Fortran
ICLUS	Integrated Climate and Land-use Change Scenarios
ICS	Incident Command System
IDEM	Indiana Department of Environmental Management
IPCC	Intergovernmental Panel on Climate Change
ISGS	Illinois State Geological Survey
LAE	Large Aquatic Ecosystem
LEED	Leadership for Energy & Environmental Design
LID	Low Impact Development
LTCPs	Long-term Control Plans
MOU	Memorandum of Understanding
MPRSA	Marine Protection, Research, and Sanctuaries Act
MRR	Mandatory Reporting Rule
NARS	National Aquatic Resource Surveys
NASA	National Aeronautics and Space Administration
NDWAC	National Drinking Water Advisory Council
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanographic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC/NAS	National Research Council of the National Academy of Sciences
NWP	National Water Program
NYSDEP	New York State Department of Environmental Protection
OAR	Office of Air and Radiation
OCSP	Office of Chemical Safety and Pollution Prevention
OECA	Office of Enforcement and Compliance Assurance
OEI	Office of Environmental Information
OEJ	Office of Environmental Justice
OGWDW	Office of Groundwater and Drinking Water
OITA	Office of International Activities and Tribal Affairs
OPEI	Office of Policy, Economics, and Innovation
ORD	Office of Research and Development
ORSANCO	Ohio River Valley Water Sanitation Commission
OSA	Office of the Science Advisor
OST	Office of Science and Technology
OSTP	Office of Science and Technology Policy
OSV	Ocean Survey Vessel
OSWER	Office of Solid Waste and Emergency Response
OW	Office of Water

OWM	Office of Wastewater Management
OWOW	Office of Wetlands, Oceans and Watersheds
P2	Pollution Prevention
POTWs	Publically Owned Treatment Works
qPCR	Quantitative Real Time Polymerase Chain Reaction
RCM	Regional Climate Models
RCRA	Resource Conservation and Recovery Act
RR	Reporting Rule
SCAP	Southern California Alliance of Publicly Owned Treatment Works
SDWA	Safe Drinking Water Act
SERMARNAT	<i>Secretaria de Medio Ambiente y Recursos Naturales</i>
SI	Sustainable Infrastructure
SRF	State Revolving Fund
STC3	State-Tribal Climate Change Council
SWAT	Surface Water Assessment Tool
TMDL	Total Maximum Daily Load
TRI-TAC	League of California Cities, the California Association of Sanitation Agencies, and the California Water Environment Association Technical Advisory Committee
UIC	Underground Injection Control
USCRTF	U.S. Coral Reef Task Force
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
WARN	Water/Wastewater Agency Response Networks
WERF	Water Environment Research Foundation
WestFAST	Western Federal Agency Support Team
WQBEL	Water-Quality Based Effluent Limitations
WQRF	Water Quality Research Program
WRF	Water Research Foundation
WWTF	Wastewater Treatment Facilities

## Disclaimer

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This *National Water Program Strategy: Response to Climate Change* provides an overview of the likely effects of climate change on water resources and the Nation's clean water and safe drinking water programs. It also describes specific actions the National Water Program intends to take to adapt program implementation in light of climate change. As such, we hope this document provides useful information and guidance to the public regarding those matters. To the extent the document mentions or discusses statutory or regulatory authority, it does so for informational purposes only. The document does not substitute for those statutes or regulations, and readers should consult the statutes or regulations themselves to learn what they require. Neither this document, nor any part of it, is itself a rule or a regulation. Thus, it cannot change or impose legally binding requirements on EPA, States, the public, or the regulated community. The use of words like "should," "could," "would," "will," "intend," "may," "might," "encourage," "expect," and "can," in this document means solely that something is intended, suggested or recommended, and not that it is legally required, or that any expressed intention, suggestion or recommendation imposes legally binding requirements on EPA, States, the public, or the regulated community. Agency decision makers remain free to exercise their discretion in choosing to implement the actions described in this Strategy.

## The National Water Program

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The National Water Program is a cooperative effort by Federal, State, Tribal, and local governments to implement core laws, including the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), and the Marine, Protection, Research and Sanctuaries Act (MPRSA), to protect and improve the quality of the Nation's waters. Key elements of this effort are intended to:

- Assure that water provided by public water systems is safe to drink;
- Protect and restore the quality of rivers, lakes, and streams;
- Improve the quality of estuarine, coastal, and ocean waters;
- Protect wetlands; and
- Restore the quality of large aquatic ecosystems around the country such as the Chesapeake Bay, the Great Lakes, and the Gulf of Mexico.

For over thirty years, EPA has worked with other Federal agencies and State, Tribal, and local governments to implement a wide range of programs to protect the Nation's waters. EPA works closely with other Federal agencies, such as the Department of Agriculture, Department of Interior, and Department of Commerce. Many of the Federal water quality programs authorized by Congress are now delegated to States and Tribes that implement the programs with the support of grants from EPA. Local governments play a critical role in this effort as the managers of the drinking water and waste treatment infrastructure and are supported with financing assistance through the State Revolving Fund (SRF) loan programs.

## Executive Summary

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This document updates the 2008 *National Water Program Strategy: Response to Climate Change*. The 2008 *Strategy* included forty-four “Key Actions” that the Workgroup planned to undertake during 2008 and 2009 that could be initiated within existing resources. EPA Regions were also asked to develop response actions.

Over the past two and a half years the National Water Program (NWP) has been implementing the Key Actions in both headquarters and regional offices resulting in significant momentum (See:

<http://www.epa.gov/water/climatechange/implementation.html>).

This *2010-2011 Update* is intended to update the Key Actions for work in the near term under current resources. On a parallel track, the NWP is examining the long-term strategic issues that climate change presents to the NWP to develop a new Strategic Plan by 2012 that recognizes a comprehensive Federal government approach that is under development by the Interagency Climate Change Adaptation Task Force, co-chaired by the Council for Environmental Quality (CEQ), the Office of Science and Technology Policy (OSTP), and the National Oceanographic and Atmospheric Administration (NOAA). EPA and the Department of the Interior (DOI) co-chair the Task Force’s Water Workgroup with over a dozen federal agencies whose missions are affected by the water-related impacts of climate change (See:

<http://www.whitehouse.gov/administration/eop/ceq/initiatives/adaptation>).

Many developments are underway throughout EPA to address both mitigation and adaptation to climate change. The NWP is collaborating with every part of EPA to develop greater capacity to address climate change, including:

- Office of Air and Radiation (OAR);
- Office of Research and Development (ORD);
- Office of Policy, Economics, and Innovation (OPEI);
- Office of Environmental Information (OEI);
- Office of Chemical Safety and Pollution Prevention (OCSPP);
- Office of Solid Waste and Emergency Response (OSWER);
- Office of the Science Advisor (OSA); and
- Office of International Activities and Tribal Affairs (OITA).

This *2010-2011 Update* includes 49 Key Actions distributed under five goals:

GOAL	Number of Key Actions
Goal 1: Mitigation of Greenhouse Gases	7
Goal 2: Adaptation to Climate Change	26
Goal 3: Change Research Related to Water	4
Goal 4: Education on Climate Change	5
Goal 5: Program Management for Climate Change	7



For **Mitigation**, the NWP is involved in water use efficiency (WaterSense, water reuse), carbon sequestration (geologic, sub-seabed), and energy efficiency and co-generation at water treatment plants.

To facilitate **Adaptation**, several voluntary programs are underway, including Climate Ready Estuaries, Climate Ready Water Utilities, Green Infrastructure, and WaterSense. Other Adaptation actions involve deployment of training, tools, funding and partnerships to build resilience, including climate and emergency preparedness and response, SRF funding, BASINS Climate Assessment Tool training, linking ecological and landscape models, and participation in the Coral Reef Task Force.

Several other Adaptation activities are underway in core programs under both the SDWA and the CWA. Examples include efforts to prevent contamination of drinking water sources, assessing risks of waterborne disease, developing biological indicators, examining the implications of ocean acidification on water quality criteria, examining criteria for hydrologic conditions, and including climate-sensitive parameters in national waterbody surveys. Other evaluations underway include considering climate implications for future effluent guidelines, Total Maximum Daily Load (TMDL) water quality analyses, the Coastal Wetlands Initiative, CWA Section 404 permitting, National Pollutant Discharge Elimination System (NPDES) permitting, nonpoint source management, and how climate change factors into the proposed stormwater rulemaking.

Under the **Research** goal, the NWP will continue collaborating to ensure that research plans inform adaptation and mitigation activities. The NWP will participate in the current Federal dialogue about the relative roles and functions of the U.S. Global Change Research Program (USGCRP), the NOAA Climate Service, and development of the National Climate Service. In addition, the NWP will partner with water research associations, NOAA, and ORD to plan a Research Forum to further inform research planning activities.

The **Education** goal builds awareness both within EPA and within NWP constituent communities. Activities include seminars, webinars, an e-newsletter, incorporating climate change into other programmatic trainings, and public presentations. The NWP is also currently revamping its climate change web page.

The **Program Management** goal ensures that climate change is integrated into ongoing program management planning and evaluation activities, including maintaining an active climate change workgroup and working closely with Regions to implement adaptation activities. Notably, as the Agency continues working to address environmental justice, climate change must be an important part and the NWP will actively engage in that dialogue. In addition, the NWP is involved in activities across EPA and the Federal government to build robust capacity to address climate change, including maintaining the informal 'AdaptNet,' working with OPEI's climate change team, and participating on the CEQ Interagency Climate Change Adaptation Task Force.

The principles of adaptive management require flexibility – and the NWP will look for opportunities to fine-tune program activities as we work with our inter-governmental partners and stakeholders on this important issue.

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## I. Water Impacts of Climate Change: A Recap

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The *2008 Strategy* reflects information about water-related impacts of climate change, as documented in reports of the Intergovernmental Panel on Climate Change (IPCC). Since the publication of the *2008 Strategy*, the USGCRP (formerly known as the U.S. Climate Change Science Program) published a series of Scientific Assessment Products, culminating in the June 2009 synthesis report titled “Global Climate Change Impacts in the United States.” The report reviews the scientific findings of the 2007 and earlier IPCC reports as well as more recent scientific findings. It describes both ongoing and expected future impacts of climate change for the United States overall as well as regional and sectoral assessments (available at: <http://www.globalchange.gov/>).

In December 2009, the EPA issued the “Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act.” The finding and the supporting Technical Support Documents and the Response to Comments also discuss observed and expected impacts of climate change in the U.S. (available at: <http://www.epa.gov/climatechange/endangerment.html>).

A review of these documents reinforces the findings that climate change has significant implications for water resources and water programs, and the conclusions of the NWP Climate Change Workgroup are that these implications need to be addressed in each part of the NWP in order to continue to achieve EPA’s mission of protecting human health and the environment.

The reader is referred to the original *2008 Strategy* for a full discussion of climate change impacts to water resources and water programs. However, the impacts to water resources can be very briefly summarized as follows:

**Increases in Water Pollution Problems** due to warmer air temperatures will result in warmer water, causing an increase in the number of waters recognized as “impaired.”

**More Extreme Water-Related Events**, including heavier precipitation in tropical and inland storms, will have adverse effects on water quality and aquatic system health.

**Changes to the Availability of Drinking Water Supplies** due to droughts, changing patterns of precipitation and snowmelt, increased evaporation, and saltwater intrusion will result in changes to the availability of water for public water supply as well as for use in agriculture, industry, and energy production.

**Waterbody Boundary Movement and Displacement** will occur as rising sea levels move ocean and estuarine shorelines and as changes in water flow and precipitation affect the size of wetlands and lakes.

**Changing Aquatic Biology** as warmer water and changing flows result in significant deterioration of aquatic ecosystem health in some areas.

**Collective Impacts on Coastal Areas** will result from a combination of sea level rise, increased damage from floods and storms, changes in drinking water supplies, and increasing temperature and acidification of the oceans.

## **II. National Water Program Strategy: Response to Climate Change**

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### **INTRODUCTION**

The *2008 Strategy* was developed by the NWP Climate Change Workgroup, which began work in March 2007, culminating in publication of the *2008 Strategy* in September 2008. The *2008 Strategy* provides an overview of the impacts of a changing climate on water resources and water programs and describes overall goals for the water program response. It included forty-four “Key Actions” that the Workgroup planned to undertake during 2008 and 2009 that could be initiated with existing resources.

Over the past two and a half years, the NWP, including both the Office of Water and the Water Divisions of the ten EPA Regions, has been implementing the Key Actions and building a foundation for action on both mitigation and adaptation. This *2010-2011 Update* is intended to update the Key Actions to guide work in the prospective near term. It is also an opportunity to reflect on the challenges ahead and to examine some of the new opportunities. Note that one of the key actions during this period is to examine the long-term strategic issues that climate change presents to the NWP in order to develop a new Strategic Plan by 2012.

Climate change is a complex problem that requires adaptive management, an approach that EPA has long advocated for issues such as watershed management. The EPA Office of Water (OW) defines adaptive management as:

“...the process by which new information about the health of the watershed is incorporated into the watershed management plan. Adaptive management is a challenging blend of scientific research, monitoring, and practical management that allows for experimentation and provides the opportunity to “learn by doing.” It is a necessary and useful tool because of the uncertainty about how ecosystems function and how management affects ecosystems (EPA 2003).”

This definition readily applies to the challenge of adapting to climate change.

Characterizing climate change as a complex problem is an understatement – and identifying appropriate actions requires flexibility to evolve as information is updated and

understanding is deepened. In that light, some of the Key Actions in the *2008 Strategy* have been deleted, either because they were completed, or because in retrospect they proved to offer less value in light of other opportunities. Some have been reframed as understanding grew and progress was made. Some activities were added as opportunities presented themselves. In any case, the current array of Key Actions reflects a growing capability at EPA and stronger partnerships with our Federal, State, Tribal and public partners. We expect that these Key Actions will also evolve over the next two years.

## GOALS

This *2010-2011 Update* retains the structure of the *2008 Strategy*, organizing the Key Actions under five major goals. However, many of the Key Actions could rightfully be included in more than one goal area, such as the WaterSense program that contributes to both mitigation and adaptation. For simplicity, however, Key Actions were grouped into one goal. The five goals are:

**Goal 1: Water Program Mitigation of Greenhouse Gases:** Use core water programs to contribute to greenhouse gas mitigation.

**Goal 2: Water Program Adaptation to Climate Change:** Adapt implementation of core water programs to maintain and improve program effectiveness in the context of a changing climate and assist States and communities in this effort.

**Goal 3: Climate Change Research Related to Water:** Strengthen the link between EPA water programs and climate change research.

**Goal 4: Water Program Education on Climate Change:** Educate water program professionals and stakeholders on climate change impacts on water resources and water programs.

**Goal 5: Water Program Management of Climate Change:** Establish the management capability within the NWP to engage climate change challenges on a sustained basis.

## THEMES

In developing Key Actions to support the five major goals, several important crosscutting themes, or principles, are kept in mind:

1. **Develop Data to Adapt to Climate Change:** Water managers need information and baseline data to understand how climate change is altering the environment and inform long-term planning.
2. **Develop Analytic Tools:** Water managers need a wide range of new analytic tools to understand and address water resources impacts of climate change.

3. **Plan for Extreme Water Events:** Water managers need to expand efforts to plan for and respond to extreme weather events resulting from climate change, including storms, floods, and a lack of water.
4. **Increase Watershed Sustainability and Resilience:** Many elements of a “watershed approach” will increase the resiliency of watersheds to climate change and increase the sustainability of aquatic systems.
5. **Strengthen Partnerships:** Water program managers need the help of many partners, including Federal agencies and State, Tribal, and local governments.

## **NEXT STEPS**

With the publication of this ***2010-2011 Update to the NWP Response to Climate Change***, the NWP continues to affirm its commitment to confront the challenge of climate change. Through implementation of the Key Actions described in this document, and through ongoing collaborative partnerships, we will continue to seek ways to build climate change into our base programs, assist our constituents and partners to do the same, and to, where possible, “erase the lines” that artificially separate programs into stovepipes while retaining the distinct authorities and mechanisms that each program brings to solving the problem. Further, as we have done in the previous two years, we will monitor the implementation of these actions and provide periodic public reports of progress.

In addition, EPA Regional Offices are working to address climate change impacts that are of greatest significance to each Region. They are working with their Regional multi-media counterparts as well as with their State, Tribal, local and public partners to foster appropriate solutions. Taken as a whole, the Office of Water and the ten EPA Regions are building a broad array of tools, information, partnerships, pilots and programs to continue to improve the understanding of both the impacts of climate change on water resources and the range of actions that might further improve the NWP response to climate change.

### III. 2010-2011 Key Action Update

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This section describes 49 Key Actions that the NWP is undertaking during 2010-2011. Many are ongoing activities; some are activities that the NWP would be implementing regardless but that take on greater importance in light of climate change, and some are new areas of exploration. As discussed in the Introduction of Section II to this document, solving a complex problem like climate change will require both sustained activity and adaptive management – and the NWP will work to ensure that its activities reflect both.

The Key Actions are organized by Goal:

- Goal 1: Water Program Mitigation of Greenhouse Gases;
- Goal 2: Water Program Adaptation to Climate Change;
- Goal 3: Climate Change Research Related to Water;
- Goal 4: Water Program Education on Climate Change; and
- Goal 5: Water Program Management of Climate Change.

#### 1. GREENHOUSE GAS MITIGATION RELATED TO WATER

**Goal 1: Water Program Mitigation of Greenhouse Gases:** Use water programs to contribute to greenhouse gas mitigation.

Much attention has been given lately to the “energy-water nexus.” Water intended for human use requires significant amounts of energy for pumping, treating, or heating. Conversely, production of energy and fuel places great demand on water supplies.

Energy efficiency preserves water for both human and ecological use. Conversely, conserving water and using it efficiently not only reduces emissions of greenhouse gases, but it also helps to stretch dwindling water supplies for municipal, agricultural and energy uses, and for preservation of ecological flows.

This interconnection makes it difficult to characterize a Key Action as either mitigation or adaptation, when in fact it is both. For the sake of simplicity, we are placing both types of actions – energy and water efficiency -- under Goal 1.

##### A. Water-Related Energy Conservation/Production

**OBJECTIVE:** Promote water-related energy conservation.

**KEY ACTION #1: Improve Energy Efficiency at Water and Wastewater Utilities.**

The NWP will continue to work with the Office of Air and Radiation (OAR) to promote energy performance benchmarking programs, use of energy audits and energy tracking systems, use of alternative energy sources within plants (e.g., solar, wind, hydro), installation of Combined Heat and Power systems for heat and energy generation in facilities that use anaerobic digesters, and will provide State and local governments information on available and emerging treatment technology. [*Formerly Key Action #1*]



Energy use by drinking water and wastewater facilities for pumping and treating water accounts for approximately three percent of the United States' energy consumption (Reardon, 1994). Drinking water and wastewater treatment facilities have the potential to achieve a 15–30 percent energy savings by implementing energy conservation measures alone (CEC, 2007). Many facilities have the capacity to generate and use energy from low-head hydroelectric, solar and/or wind power, while wastewater treatment facilities also have the capacity to generate energy from capture and use of biogas produced during anaerobic digestion of wastewater solids and to use a variety of technologies for recovering energy from sewage sludge or converting it into a fuel source.

To assist utility owners, managers, and operators of publicly owned treatment works (POTWs) that may be considering implementing energy conservation measures, the Office of Wastewater Management (OWM) is developing a report on ***Evaluation of Effective Energy Conservation Measures (ECMs) at POTWs***, which will include case studies of successful energy conservation projects designed to promote energy conservation at POTWs. The program is also developing a ***Combined Heat and Power (CHP) Technology Evaluation and Guidance*** document for utility managers of POTWs with anaerobic digesters that provides evaluations of CHP technologies for onsite heat and power production and other uses of biogas, including assessments of electrical efficiency, energy production rates, gas clean-up requirements, greenhouse gas (GHG) emissions, costs, and payback periods. Both reports should be completed by the fall of 2010.

OWM is continuing to work with Regions, States, and utilities to promote energy management at water and wastewater utilities based on the 2008 *Energy Management Guidebook for Wastewater and Water Utilities*. To date, a total of 19 introductory workshops to familiarize utilities with the steps in the Guidebook have been held with over 1,500 people in attendance. As a result of the introductory workshops, seven Regions are now working more closely with over 90 utilities to implement energy management programs based on the Guidebook, including energy assessments using Portfolio Manager. OWM and Office of Groundwater and Drinking Water (OGWDW) are also working together to develop an energy audit tool for small water and wastewater utilities. Following pilot testing, we hope to have the final audit tool available for use in 2011.

OGWDW is also developing a pocket guide on ECMs for drinking water facilities and a factsheet for conducting an energy audit in the water sector. These deliverables should be completed by the end of 2010.

## B. Water Use Efficiency

**OBJECTIVE:** promote efficient use of water to reduce energy use and to conserve water supplies.

Water efficiency offers climate change mitigation opportunities as reducing demand also reduces the energy requirements associated with moving and treating water. Water efficiency is also a component of adaptation strategies because it helps utilities reduce demand when they are stressed by water scarcity. Adaptation is supported particularly when water efficiency/conservation efforts are carried out within a broader context of integrated water resources management, including strategies to ensure availability of public water supplies. EPA has a number of program activities that are focused on reducing demand, ensuring more efficient use of water by utilities and industry, and identifying alternative supplies of water.

**KEY ACTION #2: Implement the WaterSense Program.** EPA will continue to implement the WaterSense program by developing specifications for additional products, increasing the number of program partners, and educating the public about the importance of water efficiency. Depending on available resources, EPA may expand the program further into the commercial and institutional sector. [*Formerly Key Action #2*]

The WaterSense program, which was launched by EPA in 2006, sets specifications for the labeling of products that are at least 20 percent more efficient than current standards while performing as well or better than less-efficient counterparts. The label helps consumers and businesses identify water efficient products and services that will promote water savings.

The WaterSense program will continue to develop specifications for products and services that will provide for water savings both indoors and outdoors. In 2010, the program will issue a final specification for showerheads and continue work towards a final specification for weather-based irrigation controllers. The program will continue to incorporate messaging about energy savings that can be achieved with water efficiency and support efforts of other federal agencies to implement water efficiency actions that likewise achieve energy efficiency. The program is working on a specification that would result in the first co-labeled product (pre-rinse spray valves) with ENERGYSTAR and will seek opportunities to identify additional products that would benefit from co-labeling. The program will also participate in federal collaboration efforts managed by the Department of Energy (DOE) Federal Energy Management Interagency Water Working Group to implement water efficiency provisions associated with Executive Order (EO) 13514 (Federal Leadership in Environmental, Energy, and Economic Performance).

**KEY ACTION #3: Develop Water Resources Management Tools.** The NWP will issue guidance and conduct training to help drinking water utilities control and mitigate water loss in distribution systems through leak detection and repair and metering and to address water efficiency, water availability, and water variability. [Formerly Key Action #4]

A major opportunity for improving water efficiency is the repair of leaking distribution systems, which can commonly result in the loss of ten percent or more of a city's treated water. Significant amounts of water can be saved by implementing water loss accounting, actively implementing leak detection technologies, and making timely investments in leak correction. In addition, correcting infiltration and inflow in wastewater collection systems can significantly decrease the volume of wastewater required to be treated resulting in decreased energy and chemical demand.

In 2010, OGWDW will issue a guidance focused on control and mitigation of drinking water losses in distribution systems.

**KEY ACTION #4: Assess Water Reuse.** The NWP will continue to coordinate with the National Academy of Sciences and other stakeholders to assess water reuse as an approach for meeting future water supply needs and use the assessment to potentially revise EPA's 2004 *Guidelines for Water Reuse*. [Formerly Key Action #5]

Technology to recycle and reuse wastewater is being used by communities in water scarce areas. As in the case of industrial water use, reuse of municipal wastewater reduces energy use and costs and thus reduces GHGs. It also can benefit aquatic ecosystems by recycling water to beneficial uses within a community and reducing demand for water from other locations. In 2004, EPA published guidelines for water reuse (available at <http://www.epa.gov/nrmrl/pubs/625r04108/625r04108.pdf>).

OW is funding the Water Science and Technology Board of the National Research Council of the National Academy of Sciences (NRC/NAS) to conduct study on "Assessment of Water Reuse as an Approach for Meeting Future Water Supply Needs." After the final report is received in early 2011, EPA will consider how to incorporate the recommendations into case studies, fact sheets, and technical guidance. (Information about the study is available at: <http://www8.nationalacademies.org/cp/projectview.aspx?key=48995>.)

## C. Carbon Capture and Sequestration

**OBJECTIVE:** Assure that commercial scale geologic sequestration of carbon safeguards drinking water and the ocean environment.

The President has established an Interagency Task Force on carbon capture and sequestration (CCS) to develop a Federal strategy to speed the commercial development and deployment of new coal technologies. The Task Force, co-chaired by the DOE and EPA, is developing a proposed plan to overcome the barriers to the

deployment of CCS within 10 years, with a goal of bringing five to 10 commercial demonstration projects online by 2016 (See:

<http://www.whitehouse.gov/administration/eop/ceq/initiatives/ccs>).

A critical element of ensuring that these projects can move forward is providing regulatory clarity. EPA has a key role in designing an appropriate regulatory framework to ensure the safety, efficacy, and environmental soundness of CCS. EPA has three regulatory efforts underway focused on injecting and storing carbon dioxide underground and will be initiating another focused on sub-seabed sequestration of carbon dioxide soon. These include:

- New federal requirements under the SWDA for carbon dioxide (CO<sub>2</sub>) geologic sequestration wells, which build on the regulatory framework of the existing Underground Injection Control (UIC) Program and consider the unique characteristics of carbon dioxide and the large volumes that may be injected.
- Under the Clean Air Act, a GHG reporting proposal that would establish monitoring, reporting, and recordkeeping requirements at CO<sub>2</sub> storage sites; the requirements are harmonized with UIC data collection requirements to fully utilize data gathered by the UIC permit and avoid redundancies.
- A proposed rule is currently being developed under the Resource Conservation and Recovery Act (RCRA), that, when finalized, would provide clarity with regard to the status of CO<sub>2</sub> as a hazardous waste.
- Development of guidance on procedures for permitting offshore sequestration of CO<sub>2</sub> in the sub-seabed under the Marine Protection, Research, and Sanctuaries Act (MPRSA), in coordination with other Federal agencies that have related authorities.

**KEY ACTION #5: Finalize Geologic Sequestration Regulations.** EPA will finalize regulations for siting and managing geologic sequestration (GS) projects to prevent endangerment of underground sources of drinking water. *[Formerly Key Action #8]*

In light of the growing interest in CCS, EPA is reinforcing guidance to States, Tribes and Regions on using existing authorities to permit promising CO<sub>2</sub> storage projects even while new federal regulations are being finalized. EPA will also finalize regulations for siting and managing GS projects to prevent endangerment of underground sources of drinking water. EPA will support implementation of the rule by issuing guidance on key issues and working to build technical capacity in the States and Regional direct implementation (DI) programs.

EPA program managers are working with State/Tribal permitting agencies on early projects to ensure timely identification and resolution of issues. Current options for permitting UIC wells which inject CO<sub>2</sub> include Class I (industrial), Class II, or Class V. The Agency has issued guidance for UIC Class V experimental technology wells (see UIC Program Guidance #83, 2007, [http://www.epa.gov/safewater/uic/pdfs/guide\\_uic\\_carbonsequestration\\_final-03-07.pdf](http://www.epa.gov/safewater/uic/pdfs/guide_uic_carbonsequestration_final-03-07.pdf)). The guidance outlines key technical considerations for permitting CO<sub>2</sub> injection

for GS. Meanwhile, States, Tribes and Regions can use existing authorities to permit promising CO<sub>2</sub> storage projects.

**KEY ACTION #6: Support Evaluation of Sub-Seabed and Ocean Sequestration of CO<sub>2</sub>.** EPA will work with other interested agencies and the international community to develop guidance on sub-seabed carbon sequestration and will address any requests for carbon sequestration in the sub-seabed or “fertilization” of the ocean, including any permitting under MPRSA or the UIC program that may be required. [*Formerly Key Action #10*]

Carbon can be sequestered in geologic formations under the seabed as well as on land. The 1996 Protocol to the London Convention on ocean dumping (“London Protocol”) regulates sub-seabed sequestration of CO<sub>2</sub> streams from CO<sub>2</sub> capture processes for sequestration. Parties to the London Convention and London Protocol are developing guidance for sub-seabed carbon sequestration. The NWP and the OAR are participating in this effort.

The United States is working toward ratification of the London Protocol, including the proposal of amendments to the MPRSA, to implement the treaty. One proposed change to the Act would require a permit for sub-seabed carbon sequestration.

## **2. ADAPTING WATER PROGRAMS TO CLIMATE CHANGE**

**Goal 2: Water Program Adaptation to Climate Change:** Adapt implementation of core water programs to maintain and improve program effectiveness in the context of a changing climate.

Given that most of the impacts of climate change are linked to the hydrological cycle, most of the Key Actions in the *2008 Strategy* and again in this *2010-2011 Update*, are clustered under the Adaptation goal. However, despite the sense of urgency to ‘adapt,’ much is yet to be learned, tested, and developed. The five cross-cutting themes that were articulated in the introduction help to illuminate and articulate the importance of the various Adaptation Key Actions in this section:

- Develop Data to Adapt to Climate Change;
- Develop Analytic Tools;
- Plan for Extreme Water Events;
- Increase Watershed Sustainability and Resilience; and
- Strengthen Partnerships.

## A. Drinking Water, Water Quality, and Effluent Standards

**OBJECTIVE:** Water standards continue to protect human health and the environment as the climate changes.

### Drinking Water Standards

**KEY ACTION #7: Gather Input or Information on the Impacts of Climate Change and the Potential Contamination of Drinking Water Sources and Water Supplies.**

The NWP is requesting input and/or information on climate change and how it could impact the nature and extent of contaminants in drinking water supplies and systems. [Formerly Key Action #12]

As part of the publication of the second Six Year Review, the Agency is requesting that the public provide any information or data that illustrates the impacts of climate change (e.g., changes in rainfall, drought, temperature, and snow/ice cover) on the occurrence of contaminants in drinking water, both in source water and in tap water. The Agency is also requesting data on changes in the variability of occurrence and impacts on drinking water treatment to address occurrence or variability changes. The Agency will review any information provided by commenters to determine whether it provides insights on the impacts of climate change on regulated or unregulated contaminants and how they should be addressed. EPA will consider this information in future evaluations of drinking water contaminants.

**KEY ACTION #8: Assess Clean Water Microbial Criteria and Risks of Waterborne Disease.** The NWP will assess the potential for changes in waterborne disease profiles and other water-related disease vectors as a result of climate change, including recommendations for appropriate responses (e.g., revision of biological/pathogen criteria for surface waters). [Formerly Key Action #13]

To better understand the potential problems posed to drinking water systems, the Office of Science and Technology (OST) will assess implications of climate change for biological contaminants and pathogens in surface waters and evaluate needed response actions, including the potential revision of criteria under the SDWA (e.g., individual contaminants) and the CWA (e.g., source water quality). Additionally, OST is assessing effects of changes in environmental parameters (e.g., temperature and rainfall) on recreational waters and will study tropical climates as a surrogate for waterbodies affected by climate change.

### Water Quality Standards

**KEY ACTION #9: Consider Criteria for Hydrologic Conditions.** In anticipation of impacts from intensification of the hydrologic cycle such as velocity and sediment loadings in some streams, rivers, and estuaries, the NWP will review the potential for development of narrative criteria for hydrologic conditions to protect designated uses. [Formerly Key Action #14]

OST has examined the policy and technical implications of development of narrative criteria for hydrologic conditions. OST will provide technical and policy support to Regions, States, and Tribes interested in developing such criteria for implementation to protect designated uses.

**KEY ACTION #10: Develop Biological Indicators and Methods.** The NWP will improve the biological information base to better manage water resources in a changing climate, including developing guidance on coral reef bioassessments and biological criteria. [*Formerly Key Action #15*]

In response to problems posed by climate change, the following tools and procedures will need to be fully developed and implemented:

- Measurement of biological condition and detection of changes;
- Models to forecast hydrologic and water quality changes; and
- Partnerships with land use managers.

The program will need the ability to measure and detect modifications in biological conditions as a result of climate change impacts. This may involve more extensive biological monitoring, development of indices and indicators that are sensitive to climate change impacts, and methods to link monitoring results with the effects of other stressors. This biological information base will be crucial to managing adaptation and deciding when compensation is appropriate (e.g., change activity in the watershed to maintain biology) and when revised goal setting is appropriate (i.e., to reflect reality). An example of this work is the development of guidance on coral reef bioassessments and biological criteria as part of EPA's participation in the U.S. Coral Reef Task Force.

OW is working with the ORD to understand implications of climate change for State bioassessment/biocriteria programs. Results of prior workshops are available at <http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=190304>. Several additional workshops are scheduled for late 2010.

**KEY ACTION #11: Link Ecological and Landscape Models.** The NWP will work with ORD, OAR, and Federal partners to invest in refinement of models of ecological processes and landscape hydrology. [*Formerly Key Action #16*]

ORD and OST recently developed a climate assessment tool within the BASINS decision support system (BASINS CAT). BASINS CAT currently provides a capability for creating climate change scenarios to assess the sensitivity of hydrologic and water quality endpoints to climate change using the BASINS Hydrologic Simulation Program Fortran (HSPF) watershed model. The NWP also completed incorporating similar climate assessment capabilities for the Surface Water Assessment Tool (SWAT) watershed model in BASINS.



ORD's Integrated Climate and Land-use Change Scenarios (ICLUS) project is developing national maps depicting projected changes in housing density and impervious cover by decade through 2100. ORD is also developing a downloadable and customizable geographic information system (GIS) tool that will enable local decision makers to develop their own land use change scenarios.

## **Effluent Standards**

**KEY ACTION #12: Evaluate New Industry Sectors and Existing Effluent Guidelines.** The NWP will evaluate new industry sectors and existing effluent guidelines to assess the need for new or revised technology-based performance standards. [*Formerly Key Action #17*]

EPA engages in a biannual Effluent Guidelines planning process to evaluate on a regular basis the need to develop or revise existing guidelines. In this context, EPA will take comment on issues associated with climate change and water efficiency. These comments will be integrated into the Federal Register Notice that summarizes a biannual plan to guide EPA in rulemaking targets.

**KEY ACTION #13: Review Regulatory Program Tools.** Continue to evaluate the flexibility and sensitivity of the NWP regulatory programs for climate change adaptation.

Many of the NWP regulatory programs are inherently flexible and can accommodate changes in environmental stressors or changes in industry. However, new tools may be needed to help water program personnel consider climate change in their actions. For example, to ensure that the NPDES program is prepared to provide guidance to permit writers on taking into consideration climate changes, the NPDES program was evaluated to identify areas where new data, tools or guidance might be needed (see Key Action #23).

To build on that study and prior work by ORD, the NWP will continue to evaluate the sensitivity of CWA and SDWA programs to climate change in an effort to identify areas of concern or potential future actions.

## **B. The Watershed Approach**

**OBJECTIVE:** Use the watershed approach to adapt core water programs to climate change challenges.

**KEY ACTION #14: Promote “Green Buildings” for multiple benefits** (nonpoint source control, water conservation, energy conservation): The Office of Wetlands, Oceans, and Watersheds (OWOW) will provide education, outreach, and guidance on green buildings and green infrastructure from the perspective of controlling nonpoint sources of pollution. [*Formerly Key Action #7a*]



Increasing the water and energy efficiency of water utilities has value from a GHG mitigation point of view, but sustaining these efficiencies over the long-term will require extending the commitment to water and energy efficiency into the building stock and the design of communities. By applying “green building” principles and “smart growth” policies, energy and water efficiencies at utilities can be multiplied. The NWP plays a role in this process because it regulates the stormwater and other infrastructure associated with buildings and municipalities.

Several organizations, such as the U.S. Green Building Council’s Leadership for Energy and Environmental Design (LEED) program and the American National Standards Institute (ANSI), are working with State and local governments and the private sector in promoting the “green buildings” concept and rating systems. These rating systems document the commitment made by a developer to “green” building practices, such as reduced use of energy and water, on-site (decentralized) energy generation (e.g., solar power, geothermal), and water retention (e.g., green roofs).

Recent developments are expanding this concept to integrate “smart growth,” “low impact design,” and green building practices. For example, the new LEED for Neighborhood Development (LEED-ND) pilot Rating System reaches beyond the building envelope to include site selection and design, infrastructure linkages (e.g., mass transit), and credits for onsite stormwater management practices such as green roofs, rain gardens, and vegetated swales. The NWP is working with other offices in EPA to promote “low impact design” and “smart growth” concepts in funding programs, regulatory programs, and voluntary programs. The program will also work with federal partners to implement relevant provisions associated with Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance).

## **Water Monitoring and Data**

**KEY ACTION #15: Expand National Water Resource Surveys to Include Parameters Relevant to Assessing Climate Change Impacts in the National Wetlands Survey and other pertinent activities. [Formerly Key Action #19]**

The Nation’s waters are monitored by State, Federal, Tribal, and local agencies, as well as universities, dischargers, and volunteers. Water quality data are used to characterize waters, identify trends over time, identify emerging problems, determine whether pollution control programs are working, help direct pollution control efforts to where they are most needed, and respond to emergencies such as floods and spills. As the climate changes, monitoring the condition of water resources will be increasingly important and increasingly challenging. At the same time, identifying and measuring environmental changes that result from a changing climate is both difficult and uncertain. In addition, assigning effects to “climate” as opposed to other causes is frequently challenging.

The NWP will include assessment of climate change impacts in water resources assessments at the national level, such as the recent wadeable stream assessment and

the Coastal Condition Report. These national overviews will provide useful information on climate-related changes to water resources but will also form a foundation for assessment of trends over time. To support this work, EPA will work with States, Tribes and other Federal agencies to include climate change–related measurements in monitoring programs, including reports from States under Sections 305(b) and 303(d) and ocean monitoring conducted by the Ocean Survey Vessel (OSV) *Bold*.

## **Watershed Management Tools**

**KEY ACTION #16: Produce training materials for BASINS CAT.** The NWP will produce training materials to assist EPA, State, Tribal, and other government staffs in using the CAT element of the BASINS decision support tool. [*Formerly Key Action #21*]

The NWP recently developed a climate assessment tool within the BASINS decision support system (BASINS CAT). BASINS CAT provides a capability to create climate change scenarios to assess the sensitivity of hydrologic and water quality endpoints to climate change using the BASINS HSPF watershed model. The NWP has recently developed similar climate assessment capabilities for the SWAT watershed model in BASINS (for more information about BASINS CAT, see EPA 2009b in the References section at the end of this document or visit

<http://www.epa.gov/waterscience/BASINS/>). EPA has developed training materials on the use of the model to support assessment of climate-related water resources impacts and program decisions.

## **Protecting Coastal Estuaries**

**KEY ACTION #17: Expand Climate Ready Estuaries Partnerships.** The NWP will continue to support and promote the Climate Ready Estuaries Program in partnership with the OAR's Climate Change Division. [*Formerly Key Action #22*]

The National Estuary Program (NEP), established by Congress in 1987, promotes technical transfer of information, expertise, and best management practices within 28 estuaries designated as nationally significant watersheds. The accomplishments within these watersheds also assist other coastal watersheds facing similar water pollution and water quality impairments. This approach has proven to be a success over the past 15 years and the NEP is seen as a model for other comprehensive watershed and community-based programs.

The NWP will work with individual estuary programs to promote climate change as a priority for NEP Comprehensive Conservation and Management Plan revisions. In addition, the NWP will work with the OAR to support and promote the Climate Ready Estuaries (CRE) Program. The CRE Program works with the NEPs and their partners to develop and implement adaptation plans and strategies; engage and educate stakeholders; assess climate change vulnerabilities; and share lessons learned. CRE also provides technical and financial assistance to NEPs and their partners, including information about climate adaptation, vulnerability assessment techniques,

communication and outreach tools, and contact lists of those with climate change/adaptation expertise. Eleven of the twenty-eight NEPs have received support from EPA to build additional capacity in adapting to climate change. In 2010 EPA will provide additional support to existing or new CREs, explore options to expand the CRE coastal toolkit, explore opportunities for additional interagency coordination, and continue to provide climate change adaptation information to coastal communities.

**KEY ACTION #18: Continue Coral Reef Protections:** The NWP will continue participation in the U.S. Coral Reef Task Force and support related efforts to protect coral reefs. [*Formerly Key Action #23*]

The Climate Change Working Group (CCWG) of the U.S. Coral Reef Task Force (USCRTF) is tasked with engaging in cooperative efforts to focus on impacts of climate change on coral reefs, and to develop potential management responses. Recent efforts of the CCWG have included a compilation of mandates and current actions being taken by the USCRTF member federal agencies and the jurisdictions in response to ocean acidification. The CCWG is currently analyzing ways to support local jurisdictions in advancing climate change adaptation planning for coral reef management.

The CCWG is organizing a half-day workshop on climate change adaptation that will take place on September 14, 2010, as part of the USCRTF meeting in Saipan (Commonwealth of the Northern Mariana Islands). The purpose of the workshop is to discuss the advancement of management adaptation to climate change, including impediments to and opportunities for implementing climate adaptation strategies. Through a series of presentations and facilitated discussions with participants, the CCWG will identify knowledge gaps and implementation needs for enabling managers and communities to take actions to adapt to climate change.

More information about the USCRTF can be found at: <http://coralreef.gov>.

## **Restoring Impaired Waters**

The CWA provides for listing of waters not meeting State water quality standards and the development of plans, TMDLs, for reducing pollutant loadings as needed to meet water quality standards. The NWP is encouraging States and others to look for opportunities to develop TMDLs on a watershed basis and to implement restoration at the watershed scale which will likely make the watershed more resilient to climate change impacts. The NWP will consider the long range implications for waterbody impairment associated with climate change and will make needed revisions to TMDL guidance.

**KEY ACTION #19: Develop tools for incorporating climate change impacts into TMDL water quality analyses.** OWOW will work with ORD to evaluate climate and water models with the goal of identifying tools for TMDL developers.

There are currently no established methodologies for incorporating considerations of climate change into TMDLs. With contractor assistance, OW is partnering with ORD to explore different analytical techniques for examining the water quality consequences of climate change in a TMDL context. In particular, this project will use recently available outputs from Regional Climate Models (RCMs) that provide finer-scale estimates of the future US climate (vs. the larger-scale global change models (GCMs)). Key outputs such as projected changes in precipitation and temperature profiles from several different RCMs will be input into different water models with the ultimate goal of identifying a suite of cost-effective tools that TMDL developers could choose.

**KEY ACTION #20: Evaluate considerations for addressing ocean acidification under the 303(d) program.** EPA will develop a memorandum by November 15, 2010, that describes how the Agency will approach ocean acidification under the 303(d) program.

EPA issued a Federal Register Notice on March 22, 2010 seeking public comment on how to address ocean acidification under the CWA 303(d) program. Comment was solicited as to whether EPA should issue guidance regarding the listing of waters as threatened or impaired for ocean acidification, and what that potential guidance might entail. In addition, EPA requested information regarding recommendations for TMDL development for waters impaired by ocean acidification. EPA will be evaluating these comments during the coming months, and is planning to develop a memorandum by November 15, 2010, that describes how the Agency will approach ocean acidification under the 303(d) program.

## **Nonpoint Pollution Control**

**KEY ACTION #21: Review/Revise Nonpoint Pollution Management Measures for Nutrients and Sediments.** EPA will continue to review the current guidelines and methods as new information becomes available. As nonpoint pollution control methods are better tailored to climate change, EPA will work with States to make climate change a priority for funding under Section 319. [*Formerly Key Action #24*]

Nonpoint source pollution continues to be the largest remaining source of water quality impairments in the Nation. State nonpoint source programs, developed under the CWA Section 319 Program, are working to meet this challenge.

In cooperation with NOAA, EPA developed guidelines and methods under Section 304(f)(1) and (2) of the CWA and under Coastal Zone Act Reauthorization Amendments (CZARA) of 1990 Section 6217 concerning estimates of the nature and extent of nonpoint sources of pollutants and methods to control pollution. In response to Section 502 of the Executive Order on the Chesapeake Bay, EPA completed guidelines and management measures (in May 2010) for multiple stakeholder sectors that by EO will be applicable to the federal government installations in the Bay. EPA considers these guidelines to be the most up-to-date, next generation best management practices applicable to nonpoint source runoff and can be considered for use in other parts of the

country. EPA will continue to review the current guidelines and methods in light of information related to climate change impacts on the type and extent of pollutants associated with nonpoint sources (e.g., greater storm intensity resulting in high rates of pollutant loads in runoff) as new information becomes available and will revise the guidelines and methods as needed.

As research develops and nonpoint pollution control methods are better tailored to climate change, EPA will work with States to make climate change a priority for funding under Section 319 and consider asking States and Tribes to amend nonpoint pollution management programs as needed to reflect new information relating to climate change, including information developed under Section 304(f) relating to water movement and flow and the value of wetlands in mitigating impacts of climate change.

## C. NPDES Permits

**OBJECTIVE:** NPDES permits maintain protection of water quality as the climate changes.

### Adapting the NPDES Permit Program

The five-year permitting cycle provides permit writers with a significant amount of flexibility to adapt to changing conditions. However, an awareness of the impacts of climate change by permit writers and other stakeholders will be crucial for ensuring that the program is protective of water quality within a changing climate regime. In addition, technology-based effluent limitations, water-quality based limitations, and other conditions written into NPDES permits depend upon other program inputs, such as water quality standards, effluent guidelines and standards, and TMDLs. The NPDES program will be directly impacted by a variety of intra-Agency decisions; therefore, continuous and effective intra-Agency dialogue will ensure that permit authorities are aware of, and properly able to incorporate, any new or revised permit requirements responsive to climate change.

**KEY ACTION #22: Promote “Green Infrastructure” for multiple benefits (wet weather management, water conservation, water harvesting, energy conservation, and smart growth).** The NWP will work with other EPA offices to support States, Tribes, and local governments to promote and integrate “green infrastructure” practices into permits, plans and programs. [*Formerly Key Action 7b*]

OWM will lead efforts to incorporate green infrastructure into NPDES permits, plans and programs, as well as to develop accompanying tools and guidance.

Ongoing activities include:

- Technical support to States for permit writing, to incorporate green infrastructure practices into municipal separate storm sewer system (MS4) permits and fact sheets;
- Development of a guidebook for NPDES authorities on facilitating use of green infrastructure in regulatory permitting and enforcement programs;
- Training for municipal officials who operate MS4s, combined sewers, and other wet weather systems and programs;
- Pilot collaborations to develop “green” long-term control plans (LTCPs) in select communities;
- National stormwater rule-making to more significantly emphasize management of stormwater using approaches (e.g., green infrastructure) that will mimic natural, stable hydrologic conditions;
- Development of calculator tools that provide estimates not only of wet weather management capacity of green infrastructure, but also for important metrics such as carbon sequestration and energy savings; and
- A variety of outreach and education materials on specific topics such as design and performance; operation and maintenance; and other elements of implementing green infrastructure programs.

**KEY ACTION #23: Review and Adapt NPDES Permit Program Tools.** Conduct an internal review of the flexibilities and tools in the NPDES program that can be used to respond to changing water quality/quantity conditions and new technologies; collaborate with programs within OW and across the Agency, and provide technical guidance to permit authorities and permit writers. [*Formerly Key Action #25*]

Education, outreach, and technical assistance efforts will be updated to include the potential impacts of climate change. The NPDES program intends to provide technical examples to permitting authorities and permit writers on how to assess the need for revised water quality–based effluent limitations (WQBELs) and other permit conditions, as well as other aspects of program implementation. This may include assistance on issues such as how to address changing flow regimes and hydrologic patterning effects on receiving streams and facilities.

Additional or modifications to existing guidance may be one opportunity for providing basic information on a broad range of issues that permit writers should consider when developing permits. Potential climate change–related topics that may be suitable include:

- Watershed–based permitting and the potential impacts that climate change can have on this process;
- Use of best professional judgment (BPJ) to develop technology-based effluent limitations for pollutant discharges from new technologies that may be developed to adapt to climate change;

- Ways to evaluate the need for new or revised permit conditions due to impacts caused by climate change;
- How existing data systems can be used as tools for collecting and querying information on facilities and water bodies; and
- Trainings targeted to stakeholders on specific topics related to their areas of focus (e.g., Concentrated Animal Feeding Operation (CAFOs), POTWs, and wet weather).

**KEY ACTION #24: Evaluate Stormwater NPDES Regulation.** Evaluate the feasibility of incorporating into the proposed Stormwater rulemaking the potential effects of climate change on precipitation and hydrology. *[New Key Action]*

One of the signature characteristics of climate change is an expected increase in extreme precipitation events resulting in increased stormwater runoff. Therefore, climate change is being addressed in the upcoming Stormwater NPDES rulemaking.

Unfortunately, considerable uncertainty remains in the understanding of multi-decadal climate change at the local scale at which decisions are made. Several efforts have been undertaken within the water resource planning and climate communities to develop vulnerability assessment methodologies for helping localities evaluate potential risk from a range of changes in precipitation patterns. EPA will consider including in the regulation steps that municipalities could take to consider these changes in precipitation patterns as they determine how to comply with the new requirements

See also Key Action #13.

## D. Water Infrastructure

**OBJECTIVE:** Improve water sector resilience through adoption and implementation of adaptive management practices and infrastructure.

### SRFs and Climate Change

**KEY ACTION #25: Use the Clean Water and Drinking Water SRFs to Support Eligible Projects to Address Adaptation to Climate Change.** Work with State partners to continue to clarify what types of climate change–related infrastructure expenditures are eligible for SRF assistance and support these projects as appropriate. *[Formerly Key Action #30]*

EPA and State partners will continue to use the SRFs to fund infrastructure that helps utilities to mitigate climate change (e.g., clean power for POTWs) or adapt to potential impacts of climate change (e.g., water reuse, water loss reduction). Such projects have become more prominent under requirements first adopted under the American Reinvestment and Recovery Act (ARRA) and continued in the Fiscal Year (FY) 2010 SRF appropriations, that at least 20% of each state's capitalization grant be used for

water and energy efficiency, green infrastructure, and other innovative environmental projects.

### **Climate Ready Water Utilities**

Extreme weather events, sea level rise, shifting precipitation and runoff patterns, and temperature changes all have significant implications for sustainability of the Nation's water, wastewater, and stormwater utilities (i.e., the water sector). Regardless of actions to reduce future levels of GHGs, the water sector will need to develop effective adaptation strategies to address climate change impacts.

EPA's Climate Ready Water Utilities (CRWU) program provides technical resources and tools for the water sector to develop and implement long-range plans that account for climate change impacts. By applying emergency management principles and sustainable infrastructure practices to the water sector's response to climate change, utilities will have the capability to assess risk, determine vulnerability, evaluate consequences, develop effective adaptation and mitigation strategies, and take necessary action to strengthen their critical infrastructure. CRWU activities for 2010-2011 are summarized below in Key Actions 26 - 30.

**KEY ACTION #26: Continue to collaborate with the CRWU Working Group.** The NWP will continue working with the CRWU Working Group to identify attributes of a climate ready water utility and define water sector needs to promote adoption of climate change adaptation and mitigation strategies. [*New Key Action*]

In fall 2009, EPA convened a CRWU Working Group under the National Drinking Water Advisory Council (NDWAC). The working group is charged with developing attributes of climate ready water utilities; conducting a gap analysis on climate change-related tools, training, and products to address utilities' short- and long-term needs; and identifying mechanisms that would facilitate the adoption of climate change adaptation and mitigation strategies by the water sector. Recommendations from the working group will be provided to the NDWAC, which will in turn make recommendations to EPA in fall 2010. This action also supports Key Action 41.

**KEY ACTION #27: Develop Water Utility Climate Resilience Education and Awareness Tool (CREAT).** The NWP will design and develop a Climate Change Tool to increase drinking water and wastewater operator awareness of potential climate change impacts on utility operations. [*Formerly Key Action #29*]

In spring 2009, EPA convened a workgroup to assist with development of a framework to inform the design of CREAT. CREAT is intended to increase drinking water and wastewater operator awareness of potential climate change impacts on utility operations and missions by assessing climate change threats, threshold levels for asset failures, and consequences. It will also help utilities better understand these impacts by supporting adaptation decisions with analyses of adaptation options that can reduce the identified risks and an examination of the costs of these adaptations. Design,



development and distribution of the software tool are planned for 2010 followed by outreach and training in 2011 based on availability of funding.

**KEY ACTION #28: Develop an Interactive Toolbox.** The NWP will develop an Interactive Toolbox to support utilities responding to climate change in all stages of the decision process. [*New Key Action*]

EPA is developing a web-based database with resources and tools to support utilities responding to climate change in all stages of the decision process, from basic climate science through integration of mitigation and adaptation into long-term planning. The toolbox will include: reports, articles, and publications; grant programs that could support climate-related actions by utilities and municipalities; government activities related to climate change impacts on water resources; and seminars, workshops, and training sessions. The toolbox will be released in 2010. This activity will leverage and complement work conducted under Key Action 37.

**Key Action #29: Develop and Expand Emergency Response Training.** The NWP will develop and expand emergency response training, tools, and exercises to ensure existing response planning includes impacts from climate change and to promote adoption of sustainable practices during recovery and rebuilding. [*Formerly Key Action #31*]

Training, exercises, and related tools are a critical aspect of effective emergency response planning. Throughout 2010 and 2011, EPA will work with water and wastewater utilities and related partners to incorporate climate change adaptation considerations in emergency response plans, emergency response training and exercises, Water and Wastewater Agency Response Networks, and community resilience efforts. In addition, EPA will continue to enhance tools designed to assess vulnerabilities and consequences associated with security threats to address all hazards including scenarios such as natural disasters and direct impacts associated with climate change.

A specific example of EPA's efforts in this area included the release of an updated version of the Emergency Response Tabletop CD-ROM Exercises for Drinking Water and Wastewater Systems in June 2010. Training will be offered to assist local officials in planning tabletop exercises for their locality. This updated training tool includes five scenarios related to climate change including: drought, fire in a protected catchment, flooding, impact of freeze-thaw shift on main breaks, and sea-level rise.

**KEY ACTION #30: Conduct Climate Change Awareness Seminars.** The NWP will conduct seminars for water and wastewater utilities to raise awareness of climate change regional impacts, vulnerability to impacts, and possible adaptation strategies. [*New Key Action*]

Through a collaborative partnership with EPA Regions to improve awareness of climate science and adaptation options across the water sector, regional climate change

seminars will be conducted. A pilot seminar was held in spring 2010 in EPA Region 3 and additional seminars will be scheduled. Seminars include exercises to discuss how to incorporate adaptation into infrastructure planning in the water sector and will emphasize the importance of partnerships and collaboration at the local, State, and Regional level.

## E. Wetlands Management

**OBJECTIVE:** Ensure that development of wetlands protection guidelines and policies includes consideration of climate change.

The important functions and ecosystem services provided by the nation's wetlands, streams, and other aquatic resources will continue to grow in importance as the climate changes. These resources provide crucial functions in four areas related to climate change: coastal protection, protecting water supplies, flood mitigation, and carbon sequestration.

In light of the important contributions wetlands and other aquatic resources can make to adapting to climate change, the NWP will continue to evaluate strategies for enhanced aquatic resource protection. Key themes of this assessment process are to consider a watershed approach to aquatic resource protection and to emphasize integration with other water programs.

**KEY ACTION #31: Evaluate Opportunities to Refine the 404 Regulatory Framework to Address Climate Change:** The NWP will continue to work with the Army Corps of Engineers (ACoE) to ensure effective implementation of the regulatory framework under section 404 of the CWA in a way that considers the effects of climate change. [*Formerly Key Action #32*]

Since protecting our Nation's existing aquatic resource base is critical to ensuring the country's ecological and economic resilience as climatic patterns shift, effective implementation of the Section 404 regulatory program and meeting the no net loss and net gain goal is an important part of maintaining the ability to adapt to climate change.

Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. The basic premise of the program is that no discharge of dredged or fill material may be permitted if: 1) a practicable alternative exists that is less damaging to the aquatic environment; or 2) the nation's waters would be significantly degraded. In light of the growing concerns regarding the adverse effects of climate change and the recognition that protecting the Nation's wetlands and other aquatic resources can help to mitigate these effects, EPA will continue to evaluate opportunities to refine the 404 permitting program so that the effects of climate change can be appropriately considered throughout the permitting process.

**KEY ACTION #32: Coastal Wetlands Initiative:** The Coastal Wetlands Team will conduct regional reviews of one to three coastal watersheds to understand the stressors as well as restoration and protection strategies to reduce or reverse coastal wetland loss. *[New Key Action]*

The Coastal Wetlands Initiative was launched in response to the results of a recent government report about wetland loss trends in coastal watersheds, as well to the devastation caused by Hurricanes Katrina and Rita in 2005 and Ike in 2008 which called attention to the severe threats to coastal areas posed by climate change. The Initiative has the goals of:

- Confirming wetland loss and gaining a better understanding of contributing stressors;
- Identifying and disseminating tools, strategies, policies and information to protect and restore coastal wetland resources; and
- Raising awareness of coastal wetlands to include their functions and values, potential threats, and opportunities for protection and restoration.

The Coastal Wetlands Team will conduct regional reviews of one to three coastal watersheds representative of each region. The purpose of these reviews is to understand the stressors as well as restoration and protection strategies to reduce or reverse coastal wetland loss. The coastal wetland reviews will broadly cover all stressors, tools, and strategies, but will incorporate climate change and sea level rise as related to each specific coastal region. By taking a holistic approach to understanding the threats to and stresses on coastal wetlands, the Initiative will identify tools and strategies with the potential for transferability, and aims to integrate these findings into future decision-making to help stem the loss of coastal wetland resources.

**KEY ACTION #33: National Wetlands Survey – Parameters Relevant to Assessing Climate Change Impacts:** EPA is collaborating with States, Tribes, Federal agencies, and other partners to implement a field survey of the nation's wetlands in 2011 as part of EPA's on-going series of National Aquatic Resource Surveys, including many parameters relevant to the study of climate change. *[New Key Action]*

EPA is collaborating with States, Tribes, Federal agencies, and other partners to implement a field survey of the nation's wetlands in 2011 as part of EPA's on-going series of National Aquatic Resource Surveys (NARS). The results of this effort will be used to judge progress toward the national goal of increasing the quantity and quality of the nation's wetlands. The findings will help ensure technical and financial resources are most efficiently allocated to address the greatest risks that confront wetland resources. EPA will sample 900 random sites using standardized monitoring protocols to characterize the vegetative and algal community, soil condition, and hydrology of each sample location. In 2013, EPA will produce a statistically-valid assessment of wetland ecological integrity and the stressors most commonly associated with degraded wetlands. EPA will also explore ways to quantify the ecosystem services that are derived from wetlands and their restoration and provide the framework for the continued

study of how climate change is impacting wetland quality. Preliminary discussions with EPA ORD's National Center for Environmental Assessment suggested that many of the parameters EPA plans to collect in 2011 are relevant to the study of climate change impacts, including: vegetation species composition and abundance, alien species cover, extent of hydric soils, soil characteristics, relative saturation, and relative inundation. The 2011 monitoring event will provide a baseline data layer that, in subsequent years, could be used to judge the impacts of climate change on wetland ecological integrity at multiple spatial scales.

### **3. CLIMATE CHANGE AND WATER RESEARCH**

**Goal 3: Climate Change Research Related to Water:** Strengthen the link between EPA water programs and climate change research.

The U.S. Government has a long history of conducting research on the impacts and causes of climate change. More attention is now being given to science to inform adaptation policies and sector-specific technologies, including water resource management.

Research, data collection, and tool development is needed for many aspects of water sector adaptation – including monitoring of precipitation, stream flow, and water quality; understanding the links between environmental change and human and ecological health; new methods to model projected climatological and hydrological changes; methods for planning and decision making under uncertainty; engineering and operations of drinking water, wastewater, stormwater and 'green' infrastructure; improved emergency planning and response strategies; social science for motivating behavioral change; reducing GHG emissions in the water sector and reducing water use in the energy and agricultural sectors; and more.

The water sector community is actively engaged in a variety of research. The American Water Works Association (AWWA), the Water Research Foundation (WRF), The Association for Metropolitan Water Agencies (AMWA), the Water Environment Research Foundation (WERF) and others are collaborating on research planning and funding.

EPA is participating in these national efforts and is collaborating with stakeholders. Below are some of the key activities that EPA will be engaged on in the next two years.

## A. U.S. Government Research

**OBJECTIVE:** Monitor and make good use of Federal interagency climate change research.

**KEY ACTION #34: Monitor Water Related U.S. Government Research and Reports.** The NWP will monitor the development of research and reports by the U.S. Government, including other federal agencies and the USGCRP. [Formerly Key Action #34]

The interagency USGCRP coordinates and integrates scientific research on global change and climate change, including research related to water, sponsored by 13 participating departments and agencies of the U.S. Government. The EPA ORD coordinates with other USGCRP agencies to develop and provide timely, useful, and scientifically sound information to decision makers.

Several developments are underway that will provide information for the NWP. The USGCRP has initiated planning for the third National Assessment as mandated under the Global Change Research Act of 1990; the National Academy of Sciences has issued four reports for America's Climate Choices including adaptation and informing responses (see: <http://americasclimatechoices.org/>); and NOAA is reorganizing to develop a NOAA Climate Service. A growing body of literature internationally also provides valuable information for the United States.

The NWP will continue to monitor the development of all these processes and their science products, and will use these activities and reports to refine and improve responses to climate change.

## B. EPA ORD Water Research

**OBJECTIVE:** EPA research on water issues will address climate change.

The NWP works with the EPA ORD on a range of water related research focusing on the Multi-Year Plans and Strategies for:

- Ecosystem Research;
- Water Quality Research;
- Drinking Water Research; and
- Global Change Research.

Some of this research applies to issues related to climate change.

In addition to climate change research within these water research programs, there is important research being conducted by research foundations such as the WERF and WRF. The NWP will coordinate with these agencies and foundations to maximize information sharing and to build on research efforts of common interest.

**KEY ACTION #35: Include Climate Research in Water Related ORD Research.**

The NWP will continue to work with the EPA ORD in development of water research related to climate change and will also coordinate with external research foundations engaged in water and climate change related research. [*Formerly Key Action #35*]

**Ecosystem Services Research Program**

The Ecosystem Services Research Program (ESRP) focuses on “ecosystems services, their value, and their relationship to human well being, for consistent incorporation into environmental decision making” (Ecological Research Program; Multi-Year Plan; draft 4/07). It is clear that in adapting to climate change, risk managers make choices involving land use, benefit vs. cost of ecosystem maintenance or restoration, value of preserving endangered species in a particular location, and so forth. Research in ecosystems services provides direct support in these decisions. The ESRP works in four broad areas:

- Alternative Future Scenarios for place-based analyses;
- Pushing the frontiers of interdisciplinary research;
- Assessing regional-scale vulnerability to ecosystem stressors; and
- Incorporating socioeconomic issues into restoration research.

Some specific areas of research that are particularly important to climate change include a focus on nitrogen, concentrated work on evaluating ecosystem services of wetlands, and place-based research—for which the Willamette River basin and adjacent areas and the Tampa Bay ecosystem have been selected for near term studies.

More information on the ESRP can be found at:

<http://www.epa.gov/ecology/index.htm>.

**Water Quality Research Program**

The Water Quality Research Program (WQRP) has three main long-term goals:

- Water Quality Protection: To develop water quality criteria for the protection of human health and aquatic life;
- Watershed Management: To diagnose and predict the causes of water quality impairment; develop load limits; and select, apply, and evaluate the effectiveness of watershed management measures; and
- Source Control Management: To provide information and guidance on the design and implementation of control techniques and best management measures.

WQRP research includes areas that will directly support decision making related to climate change impacts including:

- **Multiple Stressors:** Assessment of multiple stressors (i.e., changes in temperature, salinity, water flow, pH and other parameters) on the health of waters.
- **Bioassessment/Biocriteria:** In developing permits and standards to address climate change, the NWP will need a greater concentration on bioassessment and biocriteria.
- **Nutrients:** Increased water flow will mean changes in nutrient status of water bodies in some areas of the country.
- **Impacts on Infrastructure:** Combined effects of aging infrastructure and extreme weather from climate change may require changes in design and operations of infrastructure.
- **Pathogens:** Climate change may result in changes in the range of existing pathogens. New means of testing for the presence of microbial pathogens in recreational waters, drinking water and shellfish beds are being developed, including rapid indicators based on genomic and other state-of-the-art techniques.

For more information, see: <http://epa.gov/ord/npd/waterqualityresearch-intro.htm>.

## **Drinking Water Research Program**

The Drinking Water Research Program (DWRP) has two long-term goals to support the statutory requirements under the SDWA:

- **Risk Characterization Research:** To characterize health risks associated with waterborne contaminants.
- **Risk Management Research:** To control potential health risks associated with drinking water and to promote the sustainability of water resources.

Research is underway to address the following risks to ground water and surface water sources of drinking water:

- Rapid detection methods for harmful algal blooms in both freshwater and marine environments (particularly important in the context of climate change);
- Potential impacts of geologic sequestration wells on drinking water sources; and
- Investigating the potential relationship between hydraulic fracturing and water quality and public health.

For more information about the DWRP, see: <http://epa.gov/ord/npd/dwresearch-intro.htm>.

## C. EPA ORD Global Change Research

**OBJECTIVE:** The EPA ORD Global Change Research Program will address water program needs in its climate change research.

**KEY ACTION #36: Assist with Revision of ORD Global Change Multi-Year Plan.**  
OW will participate in the revision of the ORD Global Change Multi-Year Plan.  
[Formerly Key Action #36]

OW is participating with ORD to revise the EPA ORD Multi-Year Plan for Global Change Research for the 2010 to 2015 period.

ORD's Global Change Research Program (GCRP) is stakeholder-oriented, with an emphasis on assessing the potential consequences of global change on air quality, water quality, aquatic ecosystems, drinking water supplies, human health, and socioeconomic systems. ORD uses the results of these assessments to investigate water resources adaptation options to improve society's ability to respond to the risks and opportunities presented by global change, and to develop decision tools for resource managers coping with a changing climate. The ORD GCRP is an active participant with the USGCRP, the coordinating body for scientific research on global change across the federal government.

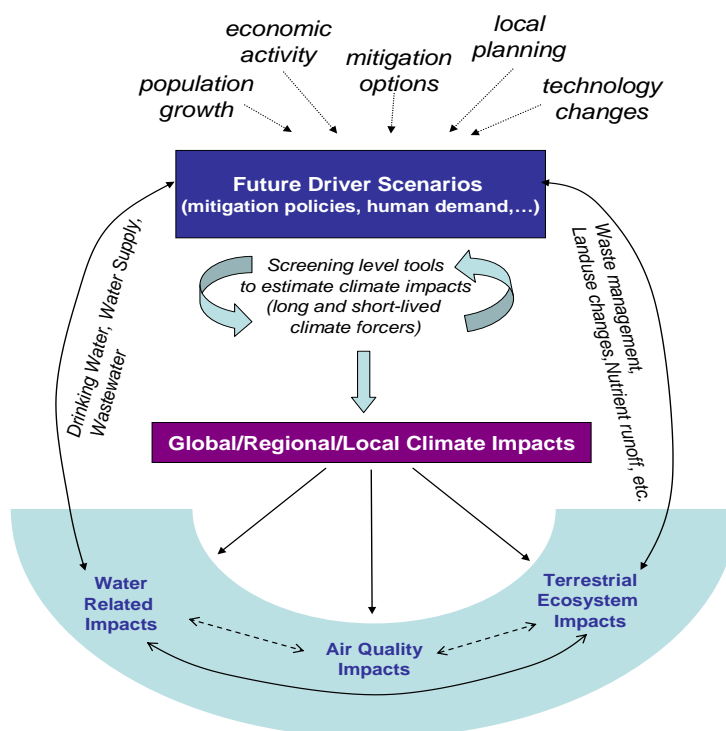


Figure 1: EPA ORD Global Change Research Program Framework.

ORD and the NWP are currently cooperating on various studies to assess the vulnerability of NWP programs to climate change, and to identify opportunities for responding to climate change. OW will monitor the development of ORD reports on climate change impacts and adaptation options for water resources, distribute the reports to water program managers, and apply the findings of the reports to program implementation.



**KEY ACTION #37: Coordinate Research Forum with ORD, Other Federal Agencies, and Industry/Utility Research Groups.** The NWP will work with external partners to improve coordination of climate change research planning for the water sector. [*New Key Action*]

In addition to work underway at ORD, WERF, WRF, other non-governmental research organizations are actively involved in the development of tools to build the capacity of the water sector to adapt to climate change and to mitigate GHG emissions. Similarly, other federal agencies are engaged in water-related climate change research and tool development. The NWP will engage and foster a dialogue between OW, ORD, NOAA, WERF and WRF and others to plan a Research Forum scheduled for late August 2010 that will identify research needs. This dialogue will inform further activities.

#### **4. WATER PROGRAM EDUCATION ON CLIMATE CHANGE**

**Goal 4: Water Program Education on Climate Change:** Educate water program professionals and stakeholders on climate change impacts on water resources and programs.

While public awareness and understanding of the impacts of climate change on water resources is still limited, there is growing awareness among water sector professionals and the environmental community about the risks and challenges that lie ahead. A large part of the challenge is that there is both an abundance of information to keep up with, as well as a paucity of information on how to adapt to or even to characterize the impacts of climate change, especially at the watershed scale at which most decisions are made.

Adapting to climate change requires us to take an adaptive management approach that inherently requires us to learn by doing and to modify plans as more information becomes available.

EPA is committed to continuing to expand its ability to disseminate relevant and useful information, to work with stakeholders and partners to coordinate education efforts, and to develop training materials and opportunities.

**KEY ACTION #38: Coordinate a NWP Seminar Series.** The NWP has established a seminar series entitled: Global Change and Adaptation of the Water Program to raise awareness of climate change and other exacerbating issues. [*New Key Action*]

EPA OW will establish a seminar series for EPA employees at HQ and Regions (remotely) to raise awareness of climate change impacts on water resources, develop the professional expertise of the NWP, facilitate integration of climate change considerations in day-to-day program operations, and strengthen interaction and collaboration with others working on climate change and water resource issues.

**KEY ACTION #39: Maintain Clearinghouse Website, e-Newsletter and other Outreach.** OW will upgrade its climate change website, and work to coordinate its online presence with other EPA offices to provide information related to water and climate change, and OW will continue its “listserv” of breaking news to interested parties. [*Formerly Key Action #37*]

Climate change science and policy is evolving rapidly and understanding of climate change impacts on water resources, and conclusions about needed response actions, change over time. At almost every stakeholder meeting, the need is voiced for a clearinghouse of validated and vetted information to help stakeholders access the latest information and tools. As a result, a number of clearinghouses are being established. Several are noted in the References at the end of this document. The NWP can also play a role in helping our community navigate the wealth of information and to help EPA listen to and learn from others.

OW will upgrade its climate change website, including coordinating with EPA Regions, other EPA offices, and other websites important to the water community, to improve access to information related to water and climate change. OW will also continue its “listserv” of breaking news to subscribers, and will continue to build-in climate change considerations in existing NWP programmatic trainings.

As part of revamping the OW climate change web site, EPA will evaluate other electronic means of disseminating useful and timely information.

**KEY ACTION #40: Produce Annual Reports on Strategy Implementation.** OW will publish annual reports describing progress in implementing this **Strategy**. [*Formerly Key Action #38*]

Over the last two years, the NWP published annual reports of progress on implementing the Key Actions identified in the *2008 Strategy*, and will continue to do so.

**KEY ACTION #41: Conduct Outreach to Partners and Stakeholders.** OW will engage with a wide variety of stakeholder organizations to improve dialogue and share information. [*Formerly Key Action #39*]

As water program partners and stakeholders have become more involved in climate change-related activities, the issues and priorities are becoming clearer and requests for information have increased. The NWP will continue to take the initiative to provide advisory groups, trade associations, and other organizations with information on climate change activities.

State and Tribal organizations are effective vehicles for providing information about climate change to water program professionals. For example, EPA relies on the NDWAC to provide advice on a range of safe drinking water program implementation issues. As noted in Key Action #26, EPA has established a working group under the NDWAC to provide advice on how to set up a CRWU program at EPA.

The NWP is also working with other associations and organizations to share information about climate change and to identify opportunities to build national capacity for adaptation to climate change. For example, the NWP has established the State-Tribal Climate Change Council (STC3), a group representing State and Tribal co-regulators, to improve dialogue and information sharing. Participating organizations include:

- Association of State and Interstate Water Pollution Control Administrators;
- Association of State Drinking Water Administrators;
- Ground Water Protection Council;
- Association of State Wetland Managers; and
- National Tribal Water Council.

As mentioned in Key Action #37, the NWP is also working with research associations to share information on climate-related research. The NWP will continue to reach out to these and other organizations during 2010-2011.

**KEY ACTION #42: Expand Water Training on Climate Change.** EPA will continue to update and revise existing training programs to include attention to the impacts of climate change on water programs and will offer training on water-related climate change impacts to national and Regional offices. [*Formerly Key Action #40*]

The *2008 Strategy* was a strong first step in building understanding of climate change issues among water program professionals, and readers are encouraged to review it for important information (available at <http://www.epa.gov/water/climatechange/>). The background information in Section II of the *2008 Strategy* provides key information about a range of climate change impacts on water resources and on water programs. OW intends to make new reports about climate change impacts on water available to a wide range of water program managers on a continuing basis with the goal of helping individual program managers to recognize climate change issues and impacts and to address these problems effectively.

The NWP has begun to develop training for water program professionals in the management, policy, and technical challenges associated with managing core clean water and safe drinking water programs. To date, a climate change module has been added to the Watershed Academy, sessions have been offered at the Water Quality Standards Academy, and other programmatic trainings are beginning to include discussions of climate change. Efforts will be made to expand such training.

As new information is developed, new training will be designed, such as for climate-related emergency planning, described in Key Action #29.

## 5. WATER PROGRAM MANAGEMENT OF CLIMATE CHANGE

**Goal 5: Water Program Management of Climate Change:** Establish the management capability within the NWP to address climate change challenges on a sustained basis.

The development of this *NWP Strategy: Response to Climate Change* was an important first step, and to sustain and build this focus the NWP will need to ensure that management and accountability practices are in place.

**KEY ACTION #43: Maintain NWP Climate Change Workgroup.** OW will maintain the NWP Climate Change Workgroup to coordinate implementation of climate change and water activities, and to develop a revised and updated Strategy. [*Formerly Key Action #41*]

The NWP Climate Change Workgroup, chaired by the Deputy Assistant Administrator for Water, includes senior managers from EPA headquarters water programs and Regional offices as well as representatives of OAR and ORD. As climate-related activities become a growing part of the base program work in the respective water programs at EPA, it becomes more important that the Workgroup facilitate coordination and communication throughout the NWP and among the various EPA offices, as well as between the NWP and other federal government Agencies and Departments that have water-related missions.

In 2010, the Workgroup is focusing on updating and implementing Key Actions for 2010-2011, and will develop a revised Strategy for 2012 and beyond.

**KEY ACTION #44: Incorporate Climate Change into the Agency Strategic Plan and in the Annual NWP Guidance.** OW will include climate change in the water elements of the 2010-2015 EPA Strategic Plan and in the Annual NWP Guidance. [*Formerly Key Action #42*]

Every three years, EPA produces a Strategic Plan that incorporates goals for all program offices and Regions. The NWP will incorporate climate change into the Water Goal in the 2010-2015 Strategic Plan.

The NWP Guidance is produced annually to provide guidance to EPA and State programs on priorities and expectations for accountability under the Government Performance and Results Act (GPRA). The FY 2009 Annual NWP Guidance, published in April 2008, included a brief discussion of implementation of the draft *Strategy*, and the FY 2010 guidance included an expanded discussion. For FY 2011, more specific reference is being made to programmatic activity. Notably, the draft Agency Strategic Plan for FY 2011-2015 includes agency-wide goals for both mitigation and adaptation, and the NWP will contribute to meeting the Agency's goals through annual commitments. For more information, see <http://www.epa.gov/ocfo/plan/plan.htm>.

**KEY ACTION #45: Incorporate Regional and LAE Additions to NWP Climate Strategy.** Each EPA Regional Water Division will continue to review and identify impacts of concern to that Region, and develop Region-specific additions to this national *Strategy*. [*Formerly Key Action #43*]

EPA Regions are actively helping State, Tribal and local governments understand climate change consequences for water resources and to build the capacity to make sound adaptation decisions. While the *2008 Strategy* described actions to be implemented at the national level and in each of the ten EPA Regions, there is significant variation in the nature and extent of climate impacts in each Region, and therefore each Region has been developing locally appropriate response actions. Some Regions have developed multi-media strategies, some are focused on mitigation, and some are engaging with federal counter-parts and State, Tribal and local stakeholders to develop adaptation capacity.

In addition, EPA's LAE program includes ten programs: Chesapeake Bay Program, Columbia River Basin, Great Lakes Program, Gulf of Mexico Program, Lake Champlain, Long Island Sound, Pacific Islands, Puget Sound- Georgia Basin, San Francisco Bay, and South Florida. Each of these programs is working to understand and address the varied impacts of climate change on each, and will be developing actions as appropriate.

Section IV of this document describes some of the activities underway in each Region. Further information about Regional and LAE activities is available at:

[http://www.epa.gov/water/climatechange/docs/Region\\_Highlights\\_Fact\\_Sheet.pdf](http://www.epa.gov/water/climatechange/docs/Region_Highlights_Fact_Sheet.pdf)

**KEY ACTION #46: Coordinate with other Federal Agencies for Climate Change Mitigation and Adaptation.** OW will work with other Federal agencies with a significant interest in the water-related impacts of climate change on a variety of interagency and national collaborative teams. [*Formerly Key Action #44*]

Since the development of the *2008 Strategy*, many new activities have been initiated throughout the federal government and new mandates are driving Departments and Agencies to collaborate in a number of ways. EPA will continue to actively participate in these and future coordination efforts. Examples include:

- Council on Environmental Quality Initiatives (more information can be found at: <http://www.whitehouse.gov/administration/eop/ceq/initiatives>):
  - Interagency Climate Change Adaptation Task Force;
  - Interagency Carbon Capture and Storage Task Force;
  - Updated Principles and Guidelines for Water and Land Related Resources Implementation Studies (P&G);
  - Interagency Ocean Policy Task Force;
  - Federal Leadership in Environmental, Energy and Economic Performance;
  - Gulf Coast Ecosystem Restoration; and

- Steps to Modernize and Reinvigorate NEPA;
- Climate Change and Water Working Group (C-CAWWG) (program managers and technical staff);
- Western Federal Agency Support Team (WestFAST) (western states federal agency technical staff) (<http://www.westgov.org/wswc/WestFAST.htm>);
- Department of the Interior SECURE Water Act (legislated mandate to improve monitoring, data collection and planning) (<http://www.usbr.gov/WaterSMART/index.html>);
- Memorandum of Understanding (MOU) with NOAA to promote healthy coastal ecosystems and sustainable and resilient coastal/waterfront communities, including climate change adaptation activities, with Climate Ready Estuaries serving as a model; and
- Federal Interagency Floodplain Management Task Force ([http://www.fema.gov/business/nfip/fifm\\_task\\_force.shtm](http://www.fema.gov/business/nfip/fifm_task_force.shtm)).

Some of the Federal agencies with an interest in water-related climate change issues that are involved in these various collaborative processes include:

- U.S. Department of Interior (Bureau of Reclamation, Geologic Survey, and Fish and Wildlife Service);
- Army Corps of Engineers;
- National Oceanic and Atmospheric Administration;
- U.S. Department of Energy;
- Federal Emergency Management Agency;
- U.S. Department of Agriculture (Natural Resources Conservation Service, Forest Service);
- Centers for Disease Control and Prevention;
- Department of Transportation (Federal Highway Administration); and
- National Science Foundation.

**KEY ACTION #47: Engage on Public Health and Environmental Justice.** Engage on Public Health and Environmental Justice by collaborating with Offices throughout EPA, other federal Agencies and other partners in workshops, studies, and other projects to expand the understanding and responses of climate change to vulnerable populations.

Vulnerability to the impacts of climate change is defined by the IPCC as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. In other words, the degree of vulnerability is influenced by exposure, sensitivity, and adaptive capacity. When either ecosystems or communities are exposed, resilience to withstand or cope is a factor of the underlying health of the system. Impaired health, lack of economic resources, or deteriorated social infrastructure can exacerbate both immediate effects of extreme events as well as the ability of individuals and communities to recover.

OW will collaborate with the Office of Environmental Justice (OEJ), the Office of Policy, Economics, and Innovation (OPEI), OAR, the Office of the Science Advisor (OSA, the American Indian Environmental Office (AIEO) and others to plan workshops and other activities that will expand the understanding and responses to climate change for vulnerable populations.

**KEY ACTION #48: Develop Guidance for Incorporating Climate Change into NWP Operations.** OW will develop a checklist to assist program staff with incorporating climate change considerations into daily operations. OW will also begin work with the EPA regulatory managers to develop technical guidance for rule writers.

There is much work underway to understand the impacts of climate change on the NWP, and to develop information and tools that can be applied to programs and decision making. Meanwhile, OW and the EPA Regions continue to conduct long-standing business of the Agency. The NWP will work to develop interim guidance for NWP staff to aid them in thinking about climate change in daily operations, and will work with Agency-wide efforts to develop defensible and flexible methods for incorporating climate change into the regulatory process.

**KEY ACTION #49: Collaborate on Agency-Wide Information Sharing and Planning Activities.** OW will work with the Office of Environmental Information (OEI) to maintain an internal 'AdaptNet' to share information with other 'early actors' throughout the Agency; and OW will work with OPEI on development of Agency-wide processes to build capacity for implementing climate change responses.

In 2007 when OW formed the NWP Climate Change Workgroup, OAR and ORD were the only EPA programs investing significant resources in climate-related programs. OAR was focused on reducing GHGs, largely through its ENERGYSTAR program, and ORD was focused on assessing the impacts of climate change in collaboration with the USGCRP. In the past two years, the landscape has changed dramatically, with staff in many Offices across EPA turning their attention to this issue. The NWP and the OEI have formed the 'AdaptNet', to promote staff level sharing of information and ideas, and the NWP is working with OPEI to develop a robust cross-Agency capacity to address climate change. These relationships, as well as the larger CEQ Interagency Adaptation Task Force, will inform future NWP long term planning for climate change activities.

## IV. Regional Strategies and Actions

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The *2008 Strategy* focused on actions that EPA Headquarters could take to begin implementing key actions to address climate change. Key Action #43 in that document (KA #46 here) identified the goal for Regions and LAEs to also begin to evaluate priorities and actions. During the past two-plus years, every Region and some LAEs have indeed taken action and are continuing to do so, as described here.

### REGION 1

Region 1 is helping to implement the *NWP Climate Change Strategy* through programs and activities that address both climate change mitigation and adaptation needs and resources.

#### Goal 1: Greenhouse Gas Mitigation Related to Water

Improve Energy Efficiency at Water and Wastewater Utilities. New England has among the highest energy rates in the nation and water and wastewater utilities are often the largest single energy cost in a municipality. Many facilities were built several decades ago to meet water permit requirements and energy efficiency was not a consideration.

Region 1 will continue to promote energy efficiency at wastewater treatment facilities (WWTFs) through the ENERGYSTAR Portfolio Manager, EPA's on-line benchmarking tool. The Region conducts workshops and provides hands-on training, and so far has assisted over 75 facilities in benchmarking their facilities to determine the energy efficiency of their plant and how they can further reduce their energy use. As a result of this work, 14 Massachusetts WWTFs received \$3.7 million in ARRA funds for energy conservation projects, with a projected reduction of 17,000 tons of CO<sub>2</sub>/year. Region 1 will be working over the next 1-2 years to expand this project to other parts of the state.

Region 1 also is working with water associations and other partners (e.g., Department of Labor) to expand existing drinking water system operators training to include water efficiency and climate change awareness. As a follow-up from the "Water Resiliency: Adapting Water Supply to Changing Climate, Land Use, and Regulation Conference," held in November 2009, EPA and the New England Water Works Association will conduct three energy efficiency workshops during 2010.

Implement the WaterSense Program. Region 1 is promoting the WaterSense Program and water conservation in general through a wide range of drinking water and green building programs and initiatives. The Region continues to recruit WaterSense partners across New England by distributing outreach materials, taking calls from media or from potential partners, and by conducting presentations and manning booths at various events. To date, the Region has a total of 106 WaterSense partners (including irrigation professionals).



Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure.”

Region 1 will continue to promote green building and infrastructure with aggressive dissemination of its 2008 publication, *A Guide to Residential Green Building in New England*, and its very popular “Green Buildings” web site ([www.epa.gov/region1/greenbuildings](http://www.epa.gov/region1/greenbuildings)). The Region also leads by example with its LEED Gold Certified Regional Laboratory and Regional Office, both of which boast energy and water efficient designs, extensive use of recycled materials in construction, and natural landscaping.

## **Goal 2: Adapting Water Programs to Climate Change**

Develop Biological Indicators and Methods. Region 1 will use the results of its September 2009 workshop, “*Data Needs to Monitor and Respond to Climate Change Impacts on Water Resources in New England*,” co-sponsored by ORD and the University of Massachusetts, to help identify appropriate environmental indicators of climate impacts on water bodies, available data sets, key data gaps, and potential uses of the data.

Expand National Water Resource Surveys to Include Climate Change Indicators.

Region 1 will continue to support the Gulf of Maine Council’s Climate Change Network and Ecosystem Indicators Partnership, which are coordinating climate change adaptation efforts by U.S. and Canadian agencies and organizations, and supporting the development of climate change indicators to assess the status and trends of the Gulf’s resources. These indicators will be used as part of a “State of the Gulf of Maine” report and conference in 2010.

Climate Ready Estuaries. Region 1 will continue to actively participate in its four Climate Ready Estuaries projects being administered by the Piscataqua Region Estuaries Partnership, the Massachusetts Bays Program, the Casco Bay Estuary Partnership, and the Long Island Sound Study.

Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools to Include Climate Change. Region 1 will continue to provide states and professional organizations with tools and information to improve the overall capabilities of water and wastewater facilities to address threats such as climate change by improving infrastructure stability and increasing operational resiliency. For example, the Region is disseminating three recently produced fact sheets entitled “Considerations for Water Infrastructure Projects;” “Preparing for Climate Change at N.E. Wastewater Utilities;” and “Preparing for Climate Change at N.E. Drinking Water Utilities.” The Region will provide technical assistance and training on asset management to help utilities position themselves better to respond to impacts from climate change and to identify and protect critical assets.

Clarify Use of the Clean and Drinking Water SRFs to Support Adaptation to Climate Change. The Region continues to promote the use of both SRF programs to address energy efficiency, the use of clean energy, and water conservation and reuse. The Region has widely circulated OW’s Clean Water SRF White Paper which details

program eligibilities including actions and projects that could be funded to address climate change.

#### **Goal 4: Water Program Education on Climate Change**

Outreach to Partners. Region 1 will work closely with other Federal agencies, States, Regional organizations, and local communities to share information about EPA programs, climate science, mitigation measures, and adaptation planning through a wide range of existing partnership programs and initiatives, including: New England Governors Council/Eastern Canadian Premiers; Northeast States for Coordinated Air Use Management; New England Interstate Water Pollution Control Commission; New England Water Works Association; New England Water Environment Association; Northeast Regional Ocean Council; Gulf of Maine Council on the Marine Environment; NEP; and New England Environmental Finance Center. Region 1 is also providing technical assistance to state adaptation planning efforts, particularly with Massachusetts, Connecticut, and Maine.

#### **Goal 5: Water Program Management of Climate Change**

Maintain OW Climate Change Workgroup. Region 1 will continue to be an active participant on the workgroup. The Region will continue to utilize our inter-office Global Climate Change Network (GCCN), which meets monthly to educate, inform, and coordinate Regional climate change activities. Region 1 will also continue our monthly “Climate Change 101” seminar series to educate employees about climate issues.

Federal Agency Water Climate Coordination Group. Region 1 will work with the Northeast Federal Partners group to follow-up on recommended actions from the “New England Federal Partners Interagency Meeting on Climate Change Adaptation,” held in June 2009, which Region 1 played a major role in organizing.

### **REGION 2**

#### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Improve Energy Efficiency at Water and Wastewater Utilities. Region 2 has funded the use of wind turbines to pump halite mine runoff from sinkholes to relieve pressure causing mud boils and prevent further degradation of Onondaga Lake.

Region 2 coordinated with the U.S. Fish and Wildlife Service (USFWS) and the New Jersey Department of Environmental Protection to address coastal barrier protection concerns in an effort to facilitate construction of a wind turbine that will help power the Bayshore, New Jersey, waste water treatment plant.

Encourage Water Efficiency and Implement the WaterSense Program. Region 2 has developed a Green Team which is working with key partners to promote innovative stormwater and water conservation techniques. Pollution Prevention (P2) inspections

emphasizing water re-use, recovery, and conservation through source reduction. Region 2 awarded a P2 grant for a rain barrel demonstration project in the Niagara River region.

The Region's P2 Team is working closely with Rahway High School on a Water Champions project which has resulted in the education of students and outreach to the community on water conservation. It is expected that the Rahway Water Champions project will lead to retrofit of the school's rest rooms with water efficient fixtures.

Support Evaluation of sub-seabed and Ocean Sequestration of CO<sub>2</sub>. Region 2 continues to work with Headquarters and the Minerals Management Service on the PurGen (Linden, New Jersey) CO<sub>2</sub> Sequestration proposal

Greenhouse Gas Mitigation Related to Water. The UIC program continues to cooperate with the New York State Department of Environmental Protection (NYSDEC) on several proposed Carbon Sequestration Projects (such as the Jamestown Oxy-Coal CCS Project).

## **Goal 2: Adapting Water Programs to Climate Change**

Biological Indicators. Region 2 is involved in the development of several biological indicators and methods including: 1) Spatial and temporal monitoring of dissolved oxygen (DO) in near coastal waters using an autonomous underwater vehicle (AUV); 2) Benthic indicators of health for the benthic community in estuarine and near shore waters of New Jersey; and 3) Quantitative real time polymerase chain reaction (qPCR) at marine bathing beaches using *Enterococcus* (comparison study of qPCR vs. conventional microbial techniques).

Climate Ready Estuaries. Region 2 has three climate ready estuaries. For status, see the CRE 2009 Progress Report at <http://www.epa.gov/climatereadyestuaries/>.

The Partnership for the Delaware Estuary (Delaware Estuary Program) has released the final report for their 2008 CRE funding effort: "Climate Change in the Delaware Estuary: Three Case Studies in Vulnerability Assessment and Adaptation Planning". See:

[http://www.delawareestuary.org/science\\_projects\\_climate\\_ready\\_products.asp](http://www.delawareestuary.org/science_projects_climate_ready_products.asp).

Coral Reef Protection. Region 2 has been promoting coral reef protection throughout the Caribbean with our Coral Reef Team. Region 2 and ORD have implemented monitoring (including ocean acidification monitoring utilizing the OSV Bold) and development of CWA biological criteria to characterize impacts of coral degradation from stressors, including climate change.

NPDES Permits. The NPDES program continues to implement/enforce the BMP of bio-sequestration at construction sites (ensuring the stabilization of soil with fast growing ground cover).

### **Goal 3: Climate Change and Water Research**

Add Climate Change Research in ORD Water Related Plans. Region 2, Region 3 and Region 9 held a concurrent, bi-coastal workshop in June 2010 to identify leading edge research and management responses on how climate change affects water quality and quantity, to determine how ongoing research in risk management and other innovative fields can better support protection and management of national water resources; and to foster collaboration between practitioners, regulators and researchers that leads to cooperative research efforts and the development of locally-based decision-support tools. Region 2 will continue to work with Regional, State and local stakeholders to improve climate adaption decision-making tools, identify areas of research needs, and improve coordination across the federal adaptation landscape.

Region 2 has been working with the Indian nations to develop a General Assistance Program (GAP) grant-funded project to evaluate climate change impacts and adaptation options on Indian lands. The project would include water management considerations.

### **Goal 5: Water Program Management of Climate Change**

Climate Change Workgroup. Region 2's Climate Change and Energy Workgroup acts in the capacity of a coordinating body to advise managers on opportunities to integrate climate change actions into specific programs. Region 2's Climate Change and Energy Workgroup is focusing on 12 proposed climate change actions. Actions present essential capacity to develop a Region 2 Climate Change Plan. The Workgroup will develop Region 2's plan. The Region has already offered five "Climate Change 101" half-day training sessions for staff which include discussion of the *NWP Climate Change Strategy* and WaterSense. Along with Regions 3 and 9, Region 2 co-hosted a 3-day water resiliency for climate change conference in June (see above).

## **REGION 3**

### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Conduct Workshops on Energy and Water Use Efficiency. Conduct workshops on energy and water use efficiency for water/wastewater infrastructure.

Work on UIC requirements for carbon sequestration. With DOE, work with energy companies regarding UIC permit requirements for the construction and operation of coal bed sequestration sites.

### **Goal 2: Adapting Water Programs to Climate Change**

Identify value of ecological impacts of sea level rise on the Delaware Estuary. Collaborate with partners to incorporate ecosystem services impacts and implement a methodology for identifying and valuing the ecological impacts of sea level rise on the New Jersey portion of the Delaware Estuary.

Support for Climate Change Adaptation in the Chesapeake Bay. Begin work to create an assessment (including a vulnerability assessment) that will help guide Frederick County, Maryland with strategic land-use decisions and address Chesapeake Bay goals and climate change initiatives.

## **REGION 4**

### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Improve Energy Efficiency at Water and Wastewater Utilities. Region 4 has and continues to hold workshops for a variety of partners regarding energy efficiency at water and wastewater facilities

Implement the WaterSense Program. Region 4 has and continues to give presentations regarding the WaterSense Program. The Region is actively working to establish new WaterSense partners.

Reduce Water Demand and Wastewater Production Through Infrastructure and Management Improvements. Region 4 has and continues to give presentations to a variety of audiences on sustainable approaches to water and wastewater infrastructure. The Region participated in development of and actively implements the EPA Program Strategy for Management of Individual and Clustered (Decentralized) Wastewater Treatment Systems. The Region is promoting sustainable approaches with our states through watershed coordination efforts.

Promote Energy Saving/Generating “Green buildings” and “Green Infrastructure.” Region 4 has and continues to give presentations to a variety of partners regarding Green Infrastructure. The Region is working with the RCRA Program to develop a methodology for local governments to review and revise the codes and ordinances to promote green development.

Develop Geologic Sequestration Regulations. Region 4 has and continues to issue UIC Class V permits for CO<sub>2</sub> experimental/test wells in the Southeast US.

### **Goal 2: Adapting Water Programs to Climate Change**

Climate Ready Estuaries. The Region is actively participating in the CRE program with five projects completed or underway. The Region intends to continue to actively participate in the program.

Clarify Use of the Clean and Drinking Water SRFs to Support Adaptation to Climate Change. The Region continues to promote the use of both SRF programs to address energy efficiency, the use of clean energy, and water conservation and reuse.

## **Goal 4: Water Program Education on Climate Change**

Outreach to Partners. The Region has and continues to reach out to partners regarding adaptation to climate change through a variety of approaches including workshops and vulnerability assessments.

## **Goal 5: Water Program Management of Climate Change**

Maintain NWP Climate Change Workgroup. Region 4 has been and will continue to be an active participant on the NWP Climate Change Workgroup and on strategy development subcommittees. In addition, Region 4 has created a Regional Energy and Climate Change Steering Committee and workgroup as well as a Water Protection Division Climate Change workgroup.

## **REGION 5**

### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Improve Energy Efficiency at Water and Wastewater Utilities.

#### *ENERGYSTAR & Energy Efficiency at Water and Wastewater Facilities*

In conjunction with the Ohio River Valley Water Sanitation Commission (ORSANCO), Region 5 hosted a POTW Nutrient Reduction and Efficiency Conference in 2010 to inform wastewater managers and consultants about way to enhance methane gas production and recovery, manage energy use, and produce greater energy efficiency through process changes.

Region 5 and the Indiana Department of Environmental Management (IDEM) are working with 12 drinking water and wastewater utilities on a two-year project to pilot the EPA's Energy Management Guidebook for Drinking Water and Wastewater Utilities. The utilities have established a baseline using Portfolio Manager. Several have developed energy policies, established an energy team, and are collecting data to use for their energy management programs.

#### *FY 2010 Green Project Reserve (GPR)*

The SRF Program's FY 2010 allocation followed the model of the ARRA legislation by directing states to use at least 20 percent of their allotted funds as a GPR. Projects funded under the GPR can include water or energy efficiency improvements, green infrastructure to manage storm water, and other environmentally innovative activities. Region 5 will continue to work with states as they assess the green components of submitted infrastructure projects.

Implement the WaterSense Program. EPA Region 5 is promoting the WaterSense Program within the water/wastewater utility sector and through sustainable development/green building programs and initiatives. The Region continues to recruit WaterSense partners by presenting at conferences and distributing outreach materials

at workshops and events. In addition, the Region will continue to work with interested partners on products and materials to further promote the program and share with others (e.g., webcasts, reports).

#### Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure.”

Region 5 recognizes that using green infrastructure approaches to address wet weather control objectives is a climate change mitigation strategy. Relatively less energy is used in constructing and operating green infrastructure control measures, as compared to grey infrastructure controls, and green infrastructure practices can help reduce Urban Heat Island effects and can sequester carbon. As rainfall patterns change in the Midwest, green infrastructure may also be an important adaptation strategy. The Region is working on voluntary approaches to accelerate the use of green infrastructure practices, and also is also seeking to set the stage for using regulatory and permit approaches to support green infrastructure approaches.

In April 2008, Region 5 and EPA Headquarters completed a policy paper on Green Infrastructure/Low Impact Development (LID) and TMDLs. The Region is currently working on three pilot projects for waters impaired due to stormwater sources to develop TMDLs that will look explicitly at flows, hydrology, and the appropriateness of green infrastructure for restoring the impaired waters. The Region has co-hosted numerous workshops and has given many presentations on technical issues and environmental and economic benefits of green infrastructure practices. The Region has been working with OWM and the Office of Enforcement and Compliance Assurance (OECA) on a Green Infrastructure Permitting and Enforcement Guide, which will be released in FY 2010. Several stormwater permits issued in Region 5 in 2008 and 2009, and being worked on in 2010, have features which foster green infrastructure practices. The Region has notified the public of four federal permits for MS4 permittees in Indian Country in Wisconsin that have conditions that will result in implementation of green infrastructure.

In 2010 the Water Division and the Great Lakes National Program Office (GLNPO), working in partnership with the Chicago Wilderness Alliance, are once again implementing a conservation and native landscaping awards program. This program recognizes sites that are exemplary in terms of green infrastructure, sustainable stormwater management, ecosystem restoration, and use of native plants. The Region is also coordinating several projects to measure/quantify the performance of green infrastructure BMPs and to share research findings. These data are needed to help address lingering uncertainty about the performance of green infrastructure approaches for meeting wet weather control needs.

Develop Geologic Sequestration Regulations. Region 5 has two very active members on both the Tier II rule making workgroup as well as the Tier III GS workgroup that is working on non-rule making efforts. The Region has agreed to help EPA Headquarters with development and review of guidance needed once the rule becomes finalized in late 2010. Region 5 has also offered to host one of EPA Headquarters’ regional presentations designed for state agencies who might consider applying for authority to

implement the proposed Class VI program. This presentation will occur shortly after the rule is finalized.

Region 5's UIC staff is also participating as members of two rules that are being developed in conjunction with the proposed Class VI rule. The first is the subpart reporting rule (RR) of the Mandatory Reporting Rule (MRR) under the Clean Air Act (CAA). This mostly addresses CO<sub>2</sub> injection at geologic sequestration and enhanced oil recovery projects. The other rule is under the RCRA. The workgroup will explore the possibility of exemptions for CO<sub>2</sub> being injected in conjunction with geologic sequestration projects. The CAA and RCRA rules are planned to be issued final and draft, respectively, at the time of the final SDWA Class VI rule in late 2010.

The Region has also been speaking at regional, national and international meetings on CCS. In late 2009 and early 2010, the Region spoke about geologic sequestration with the Chicago Climate Exchange, the Association of Environmental and Engineering Geologists, the Michigan Oil and Gas Association, participated in a knowledge sharing meeting presented by the Electric Power Research Institute (EPRI) and the Global CCS Institute (an Australian research organization). The Region will continue to explore opportunities to inform the public and the regulated community about the technology and regulatory development process for geologic sequestration.

Continue Technical Sequestration Workshops. As a part of the nationwide effort to advance CO<sub>2</sub> sequestration, the DOE has sponsored seven public/private partnerships to determine sequestration opportunities in various regions of the country. Region 5 has two DOE partnerships actively conducting research injecting CO<sub>2</sub> in the Region. Region 5's UIC program has permitted an experimental test well in Michigan for one of the partnerships. The UIC Branch is working with primacy state programs to assist in the application review and permitting of experimental CO<sub>2</sub> injection projects as well as facilitating discussion between state programs. The DOE research partnerships have two large scale CO<sub>2</sub> injection research projects planned for Illinois and either Indiana or Michigan. Region 5 is working with Illinois as they oversee CO<sub>2</sub> injection projects in various cities: Decatur (one of the DOE's research projects at an ADM ethanol plant); Mattoon (site of the proposed FutureGen power plant); and Taylorville (Tenaska is developing a coal gasification plant to generate both methane and electricity).

Region 5 co-hosted with the State of Indiana's Department of Natural Resources a regional CCS meeting in late July 2009. Representatives from DOE regional partnerships, an environmental NGO, public utility commissioners, U.S. congressional staffers, the Canadian government, universities, state regulators from OH, IN, IL and MI, energy companies, and injection well consultants attended the meeting. Region 5's UIC Branch hosted a similar CCS meeting in 2007.

The Region initiated work with the Illinois State Geological Survey (ISGS) to develop a series of training programs for the geological sequestration community. The ISGS received a DOE grant to develop training programs that will be crucial to ensure that professionals working with CCS will have the skills needed. The programs are targeted



to start being offered towards the end of 2010 and continue past the end of the grant period (Nov. 2012).

## **Goal 2: Adapting Water Programs to Climate Change**

Evaluate Opportunities to Address Wet Weather/Climate Impacts at Municipal and Industrial Operations. The Region is actively working with a major metropolitan sewer district to consider green infrastructure components in a Combined Sewer Overflow (CSO) Long Term Control Plan. See also “Green Infrastructure” discussion under Key Action Items #14 and #22.

Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools to Include Climate Change. Region 5 has been raising awareness of water and wastewater infrastructure needs and promoting practices to ensure that water and wastewater infrastructure is properly operated and maintained. Through the promotion of asset management, the region is providing states and professional organizations with tools and information to improve operational resiliency.

Develop and Expand Emergency Response Planning. The Region has helped to enhance the all-hazards security and resiliency of the water sector by hosting three major meetings on water sector resiliency, interdependencies, and emergency planning in the Chicago area. The meetings can serve as models for other locations across the country. In addition, Region 5 is promoting water conservation as part of the overall water security and resiliency messages to utilities and their customers.

Region 5 is assisting utilities in developing and launching their state Water/Wastewater Agency Response Networks (WARNs), and supporting their efforts to expand their membership. All Region 5 WARN's are operational and growing. In addition, Region 5 is supporting states' use of their EPA security grants to fund local table-top exercises, and to support development and expansion of state WARN's. Finally, the region is establishing, training, and expanding a Regional Water Team whose members can assist states' responses to water sector emergencies. Water Team members participate in state or locally-led table top exercises to increase their Incident Command System (ICS) knowledge, and to network with utilities, and local and state officials with whom they would be likely to work in an emergency.

## **Goal 5: Water Program Management of Climate Change**

Maintain NWP Climate Change Workgroup. Region 5 has been and will continue to be an active participant on the workgroup. The Region also regularly participates in the monthly national climate change sub-lead calls.

## REGION 6

### Goal 1: Greenhouse Gas Mitigation Related to Water

Sequestration of GHG Emissions. Region 6 has been and will continue to build the technical expertise for GS of CO<sub>2</sub>, and will continue to actively participate in developing and commenting on the CO<sub>2</sub> geosequestration rulemaking, scheduled for completion in late 2010. Region 6 also conducts CO<sub>2</sub> geosequestration training for water managers to ensure the protection of groundwater.

### Goal 2: Adapting Water Programs to Climate Change

Sea Level Rise/Coastal Land Loss. Coastal states in Region 6 have been affected by sea level rise, land subsidence, and coastal land loss for many years. To address these issues, Region 6 is actively promoting landscape scale coastal protection by constructing and providing technical and planning assistance for coastal restoration and adaption projects, such as the following:

- Developing engineering designs for and constructing barrier island restoration and diversion (sediments and freshwater) projects.
  - The Whiskey Back Barrier Marsh Creation Project has recently been completed, restoring 300 acres of coastal Louisiana habitat.
  - The Bayou Dupont Mississippi River Sediment Delivery Project was expanded with additional funding, restoring a total of 609 acres of coastal Louisiana marsh.
- Developing site-specific NEP restoration and adaptation project alternatives.
  - Additional funding sources have been secured for several Coastal Bend Bays & Estuaries Program hydrologic restoration and marsh enhancement projects in the Nueces Delta (Texas). Over 5,400 acres of the Delta have been purchased and are being managed with sea level rise adaptation as a fundamental principle.
  - The Matagorda Island (Texas) whooping crane habitat restoration project has been expanded in scope and will ultimately restore tidal flow and habitat over 15,000 acres.
  - Work has begun to create (for Mustang and North Padre Island) a geohazards map, which will focus on sea level rise parameters.
- Providing technical & planning assistance on high profile interagency restoration / adaptation policy and scientific evaluations, such as:
  - Interagency coordination on the topic of the "Federal Standard," a controversial issue with significant ramifications for assigning costs between navigation and coastal restoration budgets.
  - Multiple projects in Texas and Louisiana to identify opportunities for "beneficially using" (for coastal restoration purposes) material dredged to maintain some of the nation's longest coastal navigation channels.
  - The Region is lending technical assistance to the Gulf of Mexico Alliance of Governors as they develop a Gulf Regional Sediment Management Master Plan, which will incorporate opportunities for coastal restoration.

## **Goal 4: Water Program Education on Climate Change**

Inventory of Climate Change Mitigation and Adaptation Projects. Region 6 created an inventory of climate change mitigation and adaptation efforts with initial focus in coastal Texas and Louisiana. After completion of this initial phase, additional projects from other Region 6 states will be added to the inventory. This investment will go a long way to improve the quality of internal discussions at the Region and increase the likelihood that EPA's science priorities will be highly leveraged and complement the investments being made by other key stakeholders. The inventory will further allow the Region to develop a very specific understanding of how and where other federal agencies (e.g., NOAA, USFWS, ACoE, DOI, U.S. Geological Survey (USGS), National Aeronautics and Space Administration (NASA)), are investing their resources in climate change adaptation and mitigation projects.

In the coming year, Region 6 will develop a web page and GIS display of the inventory as well as an interactive system for stakeholders to populate, update, and maintain the inventory with additional projects

## **REGION 7**

### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Improve energy management and water conservation. Region 7 is working to improve energy management and water conservation by promoting the WaterSense program, promoting green infrastructure, and supporting carbon sequestration research and development.

### **Goal 2: Adapting Water Programs to Climate Change**

Promote sustainability. Region 7's adaptation activities will focus on source water protection, sustainable water infrastructure, and wetlands protection.

## **REGION 8**

Region 8's key focus over the next two years is implementation of high priority climate change mitigation activities, and the identification and implementation of high priority adaptation activities.

### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Reduce energy use by water utilities.

## **Goal 2: Adapting Water Programs to Climate Change**

Prepare for a water-constrained future.

Promote water efficiency/conservation in the agriculture sector.

## **REGION 9**

### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Improve Energy Efficiency at Water and Wastewater Utilities. The Regional Water Program created a Sustainable Infrastructure Office to develop tools and encourage activities that mitigate and adapt to the impacts of climate change. A new website was established (<http://www.epa.gov/region09/waterinfrastructure>) which provides detailed case studies of different energy efficiency and renewable energy projects at wastewater and water treatment facilities, benchmark training, a sample energy audit of a wastewater treatment facility, and incentive opportunities. The Region conducted six workshops for water and wastewater utilities (in California and Hawaii) and has benchmarked 35 utilities using ENERGYSTAR Portfolio Manager. Region 9 is also promoting renewable energy production at wastewater treatment facilities, including an effort to remove CAA regulatory barriers to generation of biogas at wastewater treatment facilities. In addition, the Region has incorporated climate change in the National Environmental Policy Act (NEPA) evaluations of infrastructure projects funded under special appropriation grants.

Implement the WaterSense Program. Region 9 is promoting the WaterSense Program through the distribution of program materials to municipalities and water utilities, through a website upgrade, and through the NEPA review process of projects funded with special appropriation grants. Water efficiency will also be promoted through Region 9's forthcoming "Cities for Climate Action" initiative. As of December 2009, Region 9 has 209 irrigation partners and 136 promotional partners. The Region is also working with community college horticulture programs to incorporate the specification for WaterSense labeling of Certification Programs for Irrigation System Installation and Maintenance Professionals into their curriculum.

Water Conservation and Management for Drinking Water Systems. Region 9 has worked with water districts to establish water conservation programs and conservation water pricing through infrastructure grant projects. The States and many local governments within Region 9 have established conservation programs to address a long-term drought. Significant ARRA funding, through the Drinking Water SRF, has gone to projects to support conservation (such as water meters).

Water Conveyance Leak Detection and Remediation. Region 9 has presented at water association conferences about water conveyance leak detection and remediation, citing case studies of Region 9 water districts who have achieved significant water savings through their leak detection programs.

Industrial Water Conservation, Reuse, and Recycling Technology Transfer. Region 9 has the only EPA website dedicated to water recycling (<http://www.epa.gov/region9/water/recycling/>). The website currently focuses on recycled water from wastewater treatment facilities but is being expanded to cover grey water reuse from residential homes. Region 9 actively engaged with the Water Reuse Association in encouraging California to modify its rules for grey water use to ease the permitting burden for homeowners. In addition, California recently adopted a Recycled Water Policy which requires water reuse plans when NPDES permits are reissued.

Federal Agency Water Conservation Guidance. The Region continues to make strides in implementing its Environment Management System (EMS) program, working in conjunction with the building owner. Region 9 joined the Federal Green Challenge and has committed to reducing its water and waste by five percent in 2009 from base year 2007. The Regional office building owner has recently installed WaterSense-labeled high efficiency dual flush toilets in all the women's bathrooms and achieved an ENERGYSTAR score of 100%.

Region 9 is collaborating with DOI, ACoE, USDA, and California to align our funding programs for water conservation, water recycling, and energy efficiency with the goal of developing projects to alleviate water demand on the California Delta, pursuant to the December 2009 Interim Federal Action Plan for the California Bay-Delta.

Promote Energy Saving/Generating "Green Buildings" and "Green Infrastructure." In FY09, Region 9 co-led the National Green Building Workgroup and emphasized priority actions focusing on climate. Region 9 also convened a stakeholder partnership with municipalities, utilities, green building organizations, and energy retrofit businesses to focus on best practices for weatherization and home energy retrofits. The Workgroup also educates local governments on how to most effectively use available stimulus funding for retrofit programs. Region 9 is encouraging a "whole home" approach including energy retrofit, water conservation, and indoor air quality improvement, with an ultimate goal of reducing GHGs.

Develop Geologic Sequestration Regulations. Region 9 is an active participant on the Geologic Sequestration Regulatory development workgroup.

Continue Technical Sequestration Workshops. Region 9 participates in workshops, including those sponsored by EPA, the International Energy Agency, the Society of Petroleum Engineers, the Ground Water Protection Council, and DOE's Carbon Sequestration Regional Partnerships (WESTCARB and Southwest Partnership).

Pilot Marketing of Nonpoint Source Biological Sequestration. As part of the implementation of the Garcia River sediment TMDL, the Nature Conservancy has purchased land within the watershed to help meet the TMDL sediment load reductions, which includes carbon sequestration credits. TNC is managing watershed forestry health which is linked to a carbon credit program.

## **Goal 2: Adapting Water Programs to Climate Change**

Climate Ready Estuaries. Region 9 is engaged with the San Francisco Estuary Partnership in its work under the CRE program. Work to date has included selection of management goals, identification of key ecosystem processes, selection of salt marshes as the ecosystem for further assessment, and conceptual models exploring the linkages among key ecosystem processes of salt marshes, climate drivers, and interacting stressors. Santa Monica Bay was recently selected to receive assistance under the CRE Program.

Continue Coral Reef Protections. Region 9 is active in the USCRTF and works with Hawaii, Guam, CNMI, and American Samoa to implement Local Action Strategies to reduce climate change and pollution threats to reefs. The Region's wetlands regulatory program reviews coastal construction projects to avoid and minimize impacts to coral reefs and develop effective mitigation projects for unavoidable impacts. These permit reviews also take rising sea levels into account.

Evaluate Opportunities to Address Wet Weather/Climate Impacts at Municipal and Industrial Operations. Region 9 routinely comments on proposed state municipal stormwater permits to encourage the incorporation of clear, enforceable provisions for LID. This has resulted in Region 9 States more aggressively and consistently including such provisions in their permits. Region 9 has also presented at conferences to promote LID and is developing internal training to increase staff skills.

Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools to Include Climate Change. Region 9 has partnered with California and the ACoE to develop a manual to assist local entities incorporate climate change considerations (both mitigation and adaptation) into their Integrated Regional Water Management Plans.

Develop a Sustainability/Vulnerability Analysis Handbook for Climate Change Impacts. The Region has used its website to promote the suite of EPA-recommended tools, including the 4-step process in managing energy consumption, as well as case studies.

Clarify Use of the Clean Water and Drinking Water SRFs to Support Adaptation to Climate Change. Region 9 encourages States to use SRF funds to promote energy and water efficiency and green infrastructure projects. Region 9 is suggesting States strive to exceed the minimum "green project reserve" requirements in the ARRA/SRF Programs. The California and Arizona SRF Loan Programs have incorporated GHG emission reduction goals into their evaluation/award process.

### **Goal 3: Climate Change and Water Research**

Regions 2, 3, and 9 held a bi-coastal workshop in June 2010 to identify needed research and decision-making tools for local adaptation work.

### **Goal 4: Water Program Education on Climate Change**

Outreach to Partners. The Region has developed a "one-stop shop" for all regional EPA climate change and energy information (<http://www.epa.gov/region09/climatechange>). The Region has engaged with water and wastewater associations (e.g., Conservation Alliance of Southern Arizona (CASA), the League of California Cities, the California Association of Sanitation Agencies, and the California Water Environment Association Technical Advisory Committee (TRI-TAC), Southern California Alliance of Publicly Owned Treatment Works (SCAP), and local chapters of AWWA, WEF, and the Water Reuse Association) and presented several times at associations' conferences.

The Region is working with each state to develop State-specific multi-media climate change strategies to ensure efforts are coordinated, duplication is reduced, and the role for the Region is developed as it is most needed by each State. Region 9 is actively participating on California's Water-Energy Climate Action Team, which includes all State agencies dealing with water or energy, to implement the State's GHG reduction law.

With the increase in funding through the ARRA, Region 9 developed "EPA Recommended Green Practices for Federally Funded Projects" in the areas of diesel emission reduction strategies, smart energy practices, green remediation, green building and construction practices, water management, and environmentally preferable purchasing. This list of environmental best practices was transmitted to States and is intended to be an insert into Regional grant awards in the future.

Region 9 participated in a Border 2012 Border States Climate Workshop with Region 6, the Boarder Environment Cooperation Commission (BECC), the *Secretaría de Medio Ambiente y Recursos Naturales* (SEMARNAT), and representatives from all ten Border States, local governments, non-profits, and other organizations, where the Region distributed a Region 9-sponsored report "U.S.-Mexico Border Region Greenhouse Gas Inventories and Policy". Region 9 is working with BECC to incorporate renewable energy and sustainable infrastructure which will reduce water pollution and conserve resources at wastewater and water utilities funded through this program.

Region 9 is developing a "Cities for Climate Action" pilot program, beginning with six cities/counties. This is a multi-media effort to partner with local government on their GHG reduction efforts. Region 9 will provide information, tools, and technical assistance to encourage local adoption and implementation of one or more community-scale GHG reduction measures. GHG reduction opportunities may include renewable energy, home energy retrofits, greening new development, smart land use, water efficiency, and composting.

Expand Water Training on Climate Change. The Region has a “Climate Change 101” course and a Climate Change Speaker Series to educate EPA staff. Region 9 has presented climate change training at Tribal conferences. Region 9 is also working with California community colleges to develop a water-related green jobs curriculum and career development for future water/energy work.

## **Goal 5: Water Program Management of Climate Change**

Climate Change Workgroup. In addition to participating on the NWP Climate Change Workgroup, Region 9 maintains its own multi-media workgroup which produced an “Energy and Climate Change Strategy” in 2007. This strategy was updated in 2009 to identify new priorities, which include promoting energy production using anaerobic digesters at wastewater treatment plants, using grant conditions to address climate change, expanding outreach and technical assistance to Federal, State and local government agencies and industrial sectors (including the “Cities For Climate Action” initiative), pursuing renewable energy production and reducing water use at contaminated sites, and promoting sustainable agriculture. In addition, the Region recently adopted a Zero Waste and Carbon Neutral Policy for our Regional operations, with a schedule of activities to meet its ambitious goals.

## **REGION 10**

### **Goal 1: Greenhouse Gas Mitigation Related to Water**

Improve Energy Efficiency at Water and Wastewater Utilities. Region 10’s Sustainable Infrastructure (SI) Team selected this key action as its principal activity for FY 2010 and 2011. Region 10 leveraged funding support from OWM to partner with the Oregon Association of Clean Water Agencies, Bonneville Power Administration, Oregon Energy Trust, EPA Region 10 PEER Center, and others to hold a 12-18 month training series for 13 wastewater utilities. The training is largely based on the *Energy Management Guidebook for Wastewater Utilities* (January, 2008). The utilities will benchmark their energy use at the beginning of the program, learn about techniques and approaches to reduce energy consumption and GHG emissions, and also be made aware of financing and incentives for efficiency and renewable power sources. A summer intern will write a case study of one utility’s experience in applying the Guidebook.

Another SI Team activity will be to conduct Train-the-Trainer sessions in Energy Management Systems and Asset Management to water and wastewater technical assistance providers and state program contacts.

The SI Team will seek Continuing Education Unit (CEU) accreditation in Oregon for participants in the Oregon Energy Project, Energy Management Systems and Asset Management courses (including Check Up Program for Small Systems (CUPPS)).



Implement the WaterSense Program. Region 10 will continue to give presentations regarding the WaterSense Program. The Region is actively working to establish new WaterSense partners.

The SI Team will conduct a Train-the-Trainer session in WaterSense to water and wastewater technical assistance providers and state program contacts.

## **Goal 2: Adapting Water Programs to Climate Change**

Expand Climate Ready Estuaries Partnerships. Two of Region 10's National Estuaries, Puget Sound Partnership and Lower Columbia River Partnership, have been selected for funding to participate in the CRE program.

Promote Green Infrastructure for Multiple Benefits. Region 10 is hiring a Stormwater/LID Technical Coordinator to further LID in stormwater permitting. Region 10 intends to incorporate LID in stormwater permits it writes to demonstrate how it may be done in the Pacific Northwest. Where possible, the analysis will assess the hydrology at a watershed scale as well as site scale.

Clarify Use of the Clean and Drinking Water SRFs to Support Adaptation to Climate Change. Region 10 will work with its states to clarify how communities can use the Clean Water and Drinking Water SRF to take actions that prepare them for the impacts of climate change. The presentation on "The White Paper" was well received by the states. They are ready to take the next step and inform and encourage communities to use the SRFs to address climate mitigation and adaptation concerns.

Many communities in Region 10 are achieving climate change co-benefits as they use ARRA and FY2010 Appropriation funds for "Green Reserve" projects. Projects include installing water meters, energy efficient pumps, and water/energy audits.

## **Goal 5: Water Program Management of Climate Change**

Maintain NWP Climate Change Workgroup. Region 10 will continue to participate on the Workgroup. Region 10 has its own Climate Change Strategy and a Climate Change Network that shares information about activities and relevant news.

Federal Agency Water Climate Coordination Group. Region 10 co-founded the Climate Change Collaboration (C<sup>3</sup>), a regional collaboration of Federal Agencies in the Pacific Northwest. The purpose of this group is to better integrate, organize, and focus the Federal community's efforts in addressing the challenges posed by climate change in the Pacific Northwest. C<sup>3</sup> holds monthly conference calls and biannual video-conferences.

## Appendix

### SUMMARY TABLES - CLIMATE CHANGE ACTIONS BY LEAD OFFICE AND REGION

This table summarizes the 49 Key Actions for 2010-2011, including the lead and supporting offices, Region or LAE for each. 2008-2009 Key Actions that have been deleted or changed are also noted as a reference for the reader.

#### Headquarter Programs Key Actions

*Note: Click on hyperlinked "New KA #" to jump to narrative descriptions in the document.*

Old KA #	New KA #	KA Title	Description	OW Lead	2010-2011 STATUS
<b>GOAL1: MITIGATION AND WATER CONSERVATION</b>					
<b>Energy Conservation/Production</b>					
1	<a href="#">1</a>	Improve Energy Efficiency/Reduce Energy Use at Water and Wastewater Utilities.	The NWP will promote implementation of energy conservations measures, energy performance benchmarking programs, and use of energy audits and energy tracking systems at water and wastewater treatment facilities. The NWP will also promote the installation of Combined Heat and Power systems for heat and energy recovery at wastewater treatment facilities that use anaerobic digesters, and will provide information to State and local governments on available and emerging treatment technology.	OWM & OGWDW with OAR	Ongoing
<b>Water Conservation</b>					
2	<a href="#">2</a>	Implement the WaterSense Program	EPA will continue to implement the WaterSense program by developing specifications for additional products, increasing the number of program partners, and educating the public about the importance of water efficiency. Depending on available resources, EPA may expand the program further into the commercial and institutional sector.	OWM	Ongoing
3					Completed
4	<a href="#">3</a>	Develop Water Resource Management Tools	The NWP will issue guidance and conduct training to help drinking water utilities control and mitigate water loss in distribution systems through leak detection and repair and metering.	OGWDW with OWM	Ongoing
5	<a href="#">4</a>	Assess Water Reuse	The NWP will continue to coordinate with the National Academy of Sciences and other stakeholders to assess water reuse as an approach for meeting future water supply needs and use the assessment to potentially revise EPA's 2004 Guidelines for Water Reuse.	OWM and OST	Ongoing
6					Completed

Old KA #	New KA #	KA Title	Description	OW Lead	2010-2011 STATUS
<b>Carbon Sequestration/Injection</b>					
8	5	Finalize Geologic Sequestration Regulations	EPA will finalize regulations for siting and managing GS projects to prevent endangerment of underground sources of drinking water. EPA will support implementation of the rule by issuing guidance on key issues and working to build technical capacity in the states and regional direct implementation (DI) programs.	OGWDW	Ongoing
9					Completed
10	6	Support Evaluation of Sub-seabed and Ocean Sequestration of CO <sub>2</sub> .	EPA will work with other interested agencies and the international community to develop guidance on sub-seabed carbon sequestration and will address any requests for carbon sequestration in the sub-seabed or "fertilization" of the ocean, including any permitting under the MPRSA.	OWOW	Ongoing
<b>Biological Sequestration</b>					
11					Deleted
<b>GOAL 2: WATER PROGRAM ADAPTATION TO CLIMATE CHANGE</b>					
<b>Water Quality And Technology Based Standards</b>					
12	7	Gather Input and Information on the Impacts of Climate Change and the Potential Contamination of Drinking Water Sources and Water Supplies.	The NWP is requesting input and/or information on climate change and how it could impact the nature and extent of contaminants in drinking water supplies and systems.	OGWDW	Ongoing
13	8	Assess Clean Water Microbial Criteria and Risks of Waterborne Disease	The NWP will assess the potential for changes in waterborne disease profiles and other water-related disease vectors as a result of climate change, including recommendations for appropriate responses (e.g., revision of biological/pathogen criteria for surface waters).	OST	Ongoing
14	9	Consider Criteria for Hydrologic Conditions	OST has also examined the policy and technical implications of hydrologic condition standards, and will provide technical and policy support to Regions and states interested in developing such criteria.	OST	Ongoing
15	10	Develop Biological Indicators and Methods	The NWP will improve the biological information base to better manage water resources in a changing climate, including developing guidance on coral reef bioassessments and biological criteria.	OST	Ongoing
16	11	Link Ecological and Landscape Models	The NWP will work with the ORD, OAR, and Federal partners to invest in refinement of models of ecological processes and landscape hydrology.	OST	Ongoing
17	12	Evaluate New Industry Sectors and Existing Effluent Guidelines.	The NWP will evaluate new industry sectors and existing effluent guidelines to assess the need for new or revised technology-based performance standards.	OST	Ongoing
18					Deleted

Old KA #	New KA #	KA Title	Description	OW Lead	2010-2011 STATUS
New KA	<b>13</b>	Review Regulatory Program Tools	Continue to evaluate the flexibility of the NWP regulatory programs for climate change adaptation.	OW	Proposed
<b>Watershed Approach</b>					
7a	<b>14</b>	Promote "Green Buildings" for Multiple Benefits (nonpoint source control, water conservation, energy conservation)	OWOW will provide education, outreach and guidance on green buildings and green infrastructure from the perspective of controlling nonpoint sources of pollution.	OWOW	Ongoing
19	<b>15</b>	Include Parameters Relevant to Assessing Climate Change Impacts in National Wetlands Survey and Other Pertinent Activities	The NWP will include assessment of climate change impacts in water resources assessments at the national level, such as the recent Wadeable Stream Assessment and the Coastal Condition Report.	OWOW	Ongoing
20					Deleted
21	<b>16</b>	Promote BASINS Climate Assessment Tool	OW will develop training materials to assist EPA, State, Tribal, and other government staffs in using the CAT element of the BASINS decision support tool.	OST	Ongoing
22	<b>17</b>	Expand Climate Ready Estuaries Partnerships	In 2010 EPA will provide additional support to existing or new CREs, explore options to expand the CRE coastal toolkit, explore opportunities for additional interagency coordination, and continue to provide climate change adaptation information to coastal communities.	OWOW	Ongoing
23	<b>18</b>	Continue Coral Reef Protections	The NWP participates in the Climate Change Working Group of the U.S. Coral Reef Task Force, which is tasked with engaging in interagency cooperative efforts to focus on impacts of climate change on coral reefs and to develop potential management responses.	OWOW	Ongoing
New KA	<b>19</b>	Develop Tools for Incorporating Climate Change Impacts into TMDL Water Quality Analyses.	OW is partnering with ORD to explore different analytical techniques for examining the water quality consequences of climate change in a TMDL context	OWOW	Initiated
New KA	<b>20</b>	Evaluate Ocean Acidification Under the 303(d) Program	EPA will develop a memorandum by November 15, 2010, that describes how the Agency will approach ocean acidification under the 303(d) program.	OWOW	Initiated
24	<b>21</b>	Review/Revise Nonpoint Pollution Management Measures for Nutrients and Sediments	EPA will continue to review the current guidelines and methods as new information becomes available. As nonpoint pollution control methods are better tailored to climate change, EPA will work with States to make climate change a priority for funding under section 319.	OWOW	Ongoing
<b>NPDES</b>					
7b	<b>22</b>	Promote "Green Infrastructure" for Multiple Benefits (stormwater flow	The NWP will work with other EPA offices to support States, Tribes, and local governments to promote and integrate "green infrastructure" practices into NPDES permits, plans and programs.	OWM	Ongoing

Old KA #	New KA #	KA Title	Description	OW Lead	2010-2011 STATUS
		management, water conservation, energy conservation, smart growth)			
25	<b>23</b>	Review and Adapt NPDES Permit Program Tools	Continue to review of the flexibilities and tools in the NPDES program that can be used to respond to changing water quality/quantity conditions and new technologies; collaborate with programs within OW and across the Agency, modify and expand training to reflect climate change, and provide technical assistance to permit authorities and permit writers.	OWM	Ongoing
New KA	<b>24</b>	Evaluate Stormwater NPDES Regulation	Evaluate the feasibility of incorporating into the proposed Stormwater rulemaking the potential effects of climate change on precipitation and hydrology.	OWM w/OST	Initiated
26					Replaced with KA #15
27					Deleted
<b>Water Infrastructure</b>					
28					Deleted
30	<b>25</b>	Use the Clean Water and Drinking Water SRFs to Support Eligible Projects to Address Adaptation to Climate Change	Work with State partners to continue to clarify what types of climate change-related infrastructure expenditures are eligible for SRF assistance and support these projects as appropriate.	OWM and OGWDW	Ongoing
New KA	<b>26</b>	Continue to collaborate with the Climate Ready Water Utilities Working Group	Recommendations from the working group will be provided to the NDWAC, which will in turn make recommendations to EPA in Fall 2010.	OGWDW with OWM	Ongoing
29	<b>27</b>	Develop Climate Resilience Evaluation and Awareness Tool (CREAT)	Design, development, and distribution of the CREAT software tool is planned for 2010, followed by outreach and training in 2011 based on availability of funding.	OGWDW	Ongoing
New KA	<b>28</b>	Develop an Interactive Toolbox	EPA is developing a toolbox to support utilities responding to climate change in all stages of the decision process, from basic climate science through integration of mitigation and adaptation into long-term planning. The toolbox will be released in 2010.	OGWDW with OW	Initiated
31					combined with KA #30
New KA	<b>29</b>	Develop and Expand Emergency Response Training, Tools, and Exercises	EPA will work with water sector utilities and related partners to incorporate climate change adaptation considerations in emergency response plans, emergency response training and exercises, WARN, and community resilience efforts.	OGWDW	Ongoing
New KA	<b>30</b>	Conduct Climate Change Awareness Seminars for Water Utilities	EPA will present seminars to water/wastewater utilities on climate change regional impacts, vulnerability to impacts, and possible adaptation strategies. Seminars will provide hands on exercises and will discuss how to incorporate adaptation into infrastructure planning in the water sector.	OGWDW	Initiated

Old KA #	New KA #	KA Title	Description	OW Lead	2010-2011 STATUS
<b>Wetlands Protection</b>					
32	<b>31</b>	Evaluate Opportunities to Refine the 404 Regulatory Framework to Address Climate Change	EPA will continue to evaluate opportunities to refine the CWA Section 404 permitting program so that the effects of climate change can be appropriately considered throughout the permitting process	OWOW	Ongoing
33					Deleted
New KA	<b>32</b>	Coastal Wetlands Initiative	The Coastal Wetlands Team implementing the Initiative will conduct regional reviews of one to three coastal watersheds representative of each region to understand the stressors as well as restoration and protection strategies to reduce or reverse coastal wetland loss.	OWOW	Initiated
New KA	<b>33</b>	National Wetlands Survey	EPA is collaborating with states, tribes, federal agencies, and other partners to implement a field survey of the nation's wetlands in 2011 as part of EPA's on-going series of National Aquatic Resource Surveys, including many parameters relevant to the study of climate change.	OWOW	Initiated
<b>GOAL 3: RESEARCH</b>					
34	<b>34</b>	Monitor Water Related USGCRP and other Reports	The NWP will monitor the development of reports by the Climate Change Science Program	OST	Ongoing
35	<b>35</b>	Include Climate Research in ORD Water Related Research Plans	The NWP will work with ORD in development of water research related to climate change and will coordinate with external research foundations engaged in water and climate change research.	OST	Ongoing
36	<b>36</b>	Assist with Revision of ORD Global Climate Multiyear Research Plan	OW will participate in the ORD revision of the Global Change Multi-Year Plan.	OST	Ongoing
New KA	<b>37</b>	Coordinate Research Forum with ORD, Other Federal Agencies, and Industry/ Utility Research Groups	The NWP will work with external partners to improve coordination of climate change research planning for the water sector.	OST	Initiated
<b>GOAL 4: EDUCATION ON CLIMATE CHANGE</b>					
New KA	<b>38</b>	Coordinate a NWP Seminar Series	The NWP has established a seminar series entitled: Global Change and Adaptation of the Water Program to raise awareness of climate change and other exacerbating issues	OST	Initiated
37	<b>39</b>	Maintain Website, e-Newsletter, webcasts	OW will upgrade its climate change website, and work to coordinate its online presence with other EPA offices to provide information related to water and climate change, and OW will continue its "listserv" of breaking news to interested parties.	OW	Ongoing
38	<b>40</b>	Produce Annual Reports on Strategy	OW will publish annual reports describing progress in implementing this <i>Strategy</i> .	OW	Ongoing

Old KA #	New KA #	KA Title	Description	OW Lead	2010-2011 STATUS
		Implementation			
39	<b>41</b>	Conduct Outreach to Partners and Stakeholders	OW will engage with a wide variety of stakeholder organizations to improve dialogue and share information.	OW	Ongoing
40	<b>42</b>	Expand Water Training on Climate Change	EPA will continue to update and revise existing training programs to include attention to the impacts of climate change on water programs.	OW	Ongoing
<b>GOAL 5: PROGRAM MANAGEMENT</b>					
41	<b>43</b>	Maintain NWP Climate Change Workgroup	Develop revised <i>Strategy</i> ; Participate in Agency-wide planning for climate adaptation.	OW	Ongoing
42	<b>44</b>	Incorporate Climate Change into Agency Strategic Plan and Annual Guidance	OW will include climate change in the water elements of the 2010-2015 EPA Strategic Plan and in the Annual NWP Guidance.	OW	Ongoing
43	<b>45</b>	Incorporate Regional and LAE Additions into NWP Climate Strategy	Each EPA Regional Water Division will continue to review and identify impacts of concern to that Region, and develop Region-specific additions to this national Strategy.	Regions & LAEs with OW	Ongoing
44	<b>46</b>	Coordinate with other Federal Agencies for Climate Change Mitigation and Adaptation	Programs within OW will work with other Federal agencies with a significant interest in the water-related impacts of climate change on a variety of interagency and national collaborative teams.	OW	Initiated
New KA	<b>47</b>	Engage on Public Health and Environmental Justice	Engage on public health and environmental justice by collaborating with Offices throughout EPA, other federal Agencies and other partners in workshops, studies, and other projects to expand the understanding and responses of climate change to vulnerable populations.	OW	Initiated
New KA	<b>48</b>	Develop guidance for incorporating climate change into OW operations	OW will develop a checklist to assist program staff with incorporating climate change considerations into daily operations, and will begin work with the EPA regulatory managers to develop technical guidance for rule writers.	OW	Initiated
New KA	<b>49</b>	Collaborate on Agency-wide information sharing and planning activities.	OW will work with OEI to maintain and internal 'AdaptNet' to share information with other 'early actors' throughout the Agency; OW will work with OPEI on development of Agency-wide processes to build capacity for implementing climate change responses.	OW	Initiated



## Regional Programs Key Actions

*Note: Click on hyperlinked Region # to jump to narrative descriptions in body of document.*

Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
<b>REGION 1</b>				
1	<a href="#">1</a>	Improve Energy Efficiency at Water and Wastewater Utilities	Region 1 will continue to promote energy efficiency at wastewater treatment facilities through the ENERGYSTAR Portfolio Manager, EPA's on-line benchmarking tool. Region 1 also is working with water associations and other partners (e.g., Department of Labor) to expand existing drinking water system operators training to include water efficiency and climate change awareness.	Ongoing
2	<a href="#">2</a>	Implement the WaterSense Program	Region 1 is promoting the WaterSense Program and water conservation in general through a wide range of drinking water and green building programs and initiatives. The Region continues to recruit WaterSense partners across New England by distributing outreach materials, taking calls from media or from potential partners, and by doing presentations and booths at various events. To date, the Region has a total of 106 WaterSense partners (including irrigation systems).	Ongoing
7	<a href="#">14; 22</a>	Promote "Green Buildings" for Multiple Benefits; Promote Green Infrastructure for Multiple Benefits	Region 1 will continue to promote green building and infrastructure with aggressive dissemination of its 2008 publication, A Guide to Residential Green Building in New England, and it's very popular "Green Buildings" web site ( <a href="http://www.epa.gov/region1/greenbuildings">www.epa.gov/region1/greenbuildings</a> ). The Region also leads by example with its LEED Gold Certified Regional Laboratory and Regional Office, both of which boast energy and water efficient designs, extensive use of recycled materials in construction, and natural landscaping.	Ongoing
15	<a href="#">10</a>	Develop Biological Indicators and Methods	Region 1 will use the results of its September 2009 workshop, "Data Needs to Monitor and Respond to Climate Change Impacts on Water Resources in New England," co-sponsored by ORD and the University of Massachusetts, to help identify appropriate environmental indicators of climate impacts on water bodies, available data sets, key data gaps, and potential uses of the data.	Ongoing
19	<a href="#">15</a>	Include Parameters Relevant to Assessing Climate Change Impacts in National Wetlands Survey and Other Pertinent Activities	Region 1 will continue to support the Gulf of Maine Council's Climate Change Network and Ecosystem Indicators Partnership, which are coordinating climate change adaptation efforts by U.S. and Canadian agencies and organizations, and supporting the development of climate change indicators to assess the status and trends of the Gulf's resources. These indicators will be used as part of a "State of the Gulf of Maine" report and conference in 2010.	Ongoing
22	<a href="#">17</a>	Expand Climate Ready Estuaries Partnerships	Region 1 will continue to actively participate in its four CRE projects being administered by the Piscataqua Region Estuaries Partnership, the Massachusetts Bays Program, the Casco Bay Estuary Partnership, and the Long Island Sound Study.	Ongoing



Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
28	--	Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools to Include Climate Change	Region 1 will continue to provide states and professional organizations with tools and information to improve the overall capabilities of water and wastewater facilities to address threats such as climate change by improving infrastructure stability and increasing operational resiliency. One tool will be dissemination of three recently produced fact sheets, entitled, "Considerations for Water Infrastructure Projects;" "Preparing for Climate Change at N.E. Wastewater Utilities;" and "Preparing for Climate Change at N.E. Drinking Water Utilities." The Region will provide technical assistance and training on "asset management" to help utilities position themselves better to respond to impacts from climate change and to identify and protect critical assets.	Ongoing
30	25	Use the Clean and Drinking Water SRFs to Support Eligible Projects to Address Adaptation to Climate Change	The Region continues to promote the use of both SRF programs to address energy efficiency, the use of clean energy, and water conservation and reuse. The Region has widely circulated OW's Clean Water SRF White Paper which details program eligibilities including actions and projects that could be funded to address climate change.	Ongoing
39	41	Conduct Outreach to Partners and Stakeholders	Region 1 will work closely with other federal agencies, states, regional organizations, and local communities to share information about EPA programs, climate science, mitigation measures, and adaptation planning through a wide range of existing partnership programs and initiatives,	Ongoing
41	43	Maintain NWP Climate Change Workgroup	Region 1 will continue to be an active participant on the workgroup. We will continue to utilize our inter-office Global Climate Change Network (GCCN), which meets monthly to educate, inform, and coordinate Regional climate change activities. We also will continue our monthly "Climate Change 101" seminar series to educate EPA employees about climate issues.	Ongoing
44	46	Coordinate with Other Federal Agencies for Climate Change Mitigation and Adaptation	Region 1 will work with the Northeast Federal Partners group to follow-up on recommended actions from the "New England Federal Partners Interagency Meeting on Climate Change Adaptation," held in June 2009, which EPA played a major role in organizing.	Ongoing
<b>REGION 2</b>				
1	1	Improve Energy Efficiency at Water and Wastewater utilities	Region 2 has funded the use of wind turbines to pump halite mine runoff from sinkholes to relieve pressure causing mud boils and prevent further degradation of Onondaga Lake.	Ongoing
22	17	Expand Climate Ready Estuaries Partnerships	Region 2 has three climate ready estuaries. For status, see the CRE 2009 Progress Report at <a href="http://www.epa.cre">www.epa.cre</a> .	Ongoing
10	6	Support Evaluation of Sub-Seabed and Ocean Sequestration of CO <sub>2</sub>	Region 2 continues to work with Headquarters on the PurGen (Linden, NJ) CO <sub>2</sub> Sequestration proposal.	Ongoing

Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
23	18	Continue Coral Reef Protections	Region 2 has been promoting coral reef protection throughout the Caribbean with our Coral Reef Team. Region 2 and ORD have implemented monitoring (including ocean acidification monitoring utilizing the OSV Bold) and development of CWA biological criteria to characterize impacts of coral degradation from stressors, including climate change.	Ongoing
41	43	Maintain the NWP Climate Change Workgroup	Region 2's Climate Change and Energy Workgroup acts in the capacity of a coordinating body to advise managers on opportunities to integrate cc actions into specific programs. Region 2's Climate Change and Energy Workgroup is focusing on twelve proposed CC actions. Actions present essential capacity to develop a Region 2 Climate Change Plan. The Workgroup will develop Region 2 plan.	Ongoing
15	10	Develop Biological Indicators and Methods	Region 2 is involved in the development of several biological indicators and methods including: 1) Spatial and Temporal Monitoring of DO in Near Coastal Waters using an AUV; 2) Benthic Indicators of health for the benthic community in estuarine and nearshore waters of NJ; 3) Quantitative qPCR at marine bathing beaches using Enterococcus (comparison study of qPCR vs. conventional microbial techniques).	Ongoing
2	2	Implement the Water Sense Program	Region 2 has developed a Green Team which is working with key partners to promote innovative stormwater and water conservation techniques. P2 inspections emphasizing water re-use recovery and conservation through source reduction. Region 2 awarded a grant for a rain barrel demonstration project.	Ongoing
35	35	Include Climate Change Research in ORD Water Related Plans	Region 2, Region 3 and Region 9 will hold a concurrent, bi-coastal workshop in June 2010 to identify leading edge research and management responses on how climate change affects water quality and quantity, to determine how ongoing research in risk management and other innovative fields can better support protection and management of national water resources; and to foster collaboration between practitioners, regulators and researchers that leads to cooperative research efforts and the development of locally-based decision-support tools.	Ongoing
<b>REGION 3</b>				
1	1	Improve Energy Efficiency/Reduce Energy Use at Water and Wastewater Utilities	Conduct workshops on energy and water use efficiency for water/wastewater infrastructure.	Ongoing
8	5	Finalize Geologic Sequestration Regulations	With DOE, work with energy companies on UIC permit requirements for the construction and operation of coal bed sequestration sites.	Ongoing
22	17	Expand Climate Ready Estuaries Partnerships	Collaborate with partners to incorporate ecosystem services impacts and implement a methodology for identifying and valuing the ecological impacts of sea level rise on the New Jersey portion of the Delaware Estuary.	Ongoing

Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
--	R3-1	Support for Climate Change Adaptation in the Chesapeake Bay	Begin work to create an assessment (including a vulnerability assessment) that will help guide Frederick County, Maryland with strategic land-use decisions and address Chesapeake Bay goals and climate change initiatives.	Ongoing
<b>REGION 4</b>				
1	<b>1</b>	Improve Energy Efficiency at Water and Wastewater Utilities	Region 4 has and continues to hold workshops for a variety of partners regarding energy efficiency at water and wastewater facilities	Ongoing
2	<b>2</b>	Implement the WaterSense Program	Region 4 has and continues to give presentations regarding the WaterSense Program. The Region is actively working to establish new WaterSense partners.	Ongoing
28	--	Reduce Water Demand and Wastewater Production through Infrastructure and Management Improvements	Region 4 has and continues to give presentations to a variety of audiences on sustainable approaches to water and wastewater infrastructure. The Region participated in development of and actively implements, the EPA Program Strategy for Management of Individual and Clustered (Decentralized) Wastewater Treatment Systems. The Region is promoting sustainable approaches with our states through watershed coordination efforts.	Ongoing
7	<b>14; 22</b>	Promote "Green Buildings" for Multiple Benefits; Promote Green Infrastructure for Multiple Benefits	Region 4 has and continues to give presentations to a variety of partners regarding Green Infrastructure. The Region is working with our RCRA Program to develop a methodology for local governments to review and revise the codes and ordinances to promote green development.	Ongoing
8	<b>5</b>	Finalize Geologic Sequestration Regulations	Region 4 has and continues to issue UIC Class V permits for CO <sub>2</sub> experimental/test wells in the Southeast US.	Ongoing
22	<b>17</b>	Expand Climate Ready Estuaries Partnerships	The Region is actively participating in the CRE program with five projects completed or underway. The Region intends to continue to actively participate in the program.	Ongoing
30	<b>25</b>	Use the Clean and Drinking Water SRFs to Support Eligible Projects to Address Adaptation to Climate Change	The Region continues to promote the use of both SRF programs to address energy efficiency, the use of clean energy, and water conservation and reuse.	Ongoing
39	<b>41</b>	Conduct Outreach to Partners and Stakeholders	The Region has and continues to reach out to partners regarding adaptation to climate change through a variety of approaches including workshops and vulnerability assessments.	Ongoing
41	<b>43</b>	Maintain the NWP Climate Change Workgroup	Region 4 has been and will continue to be an active participant on the Office of Water Climate Change workgroup and on strategy development subcommittees. In addition, Region 4 has created a Regional Energy and Climate Change Steering Committee and workgroup as well as a Water Protection Division Climate Change workgroup.	Ongoing

Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
<b>REGION 5</b>				
1	1	Improve Energy Efficiency/Reduce Energy Use at Water and Wastewater Facilities	Region 5 and IDEM are working with 12 drinking water and wastewater utilities on a two-year project to pilot the EPA's Energy Management Guidebook for Drinking Water and Wastewater Utilities.	Ongoing
30	25	Use the Clean and Drinking Water SRFs to Support Eligible Projects to Address Adaptation to Climate Change	In Region 5 will continue to work with states as they assess the green components of submitted infrastructure projects.	Ongoing
2	2	Implement the WaterSense Program	EPA Region 5 is promoting the WaterSense Program within the water/wastewater utility sector and through sustainable development/green building programs and initiatives	Ongoing
7	14; 22	Promote "Green Buildings" for Multiple Benefits; Promote Green Infrastructure for Multiple Benefits	The Region is working on voluntary approaches to accelerate use of green infrastructure practices, and also is also seeking to set the stage for using regulatory and permit approaches to support green infrastructure approaches.	Ongoing
8	5	Finalize Geologic Sequestration Regulations	Region 5 is active on the development of several rules related to GS of carbon dioxide under SDWA, CAA and RCRA.	Ongoing
9	--	Continue Technical Workshops	Region 5 has two DOE active partnerships conducting research on injecting CO <sub>2</sub> and the Region is working with the Illinois State Geological Survey (ISGS) to develop a series of training programs for the geological sequestration community.	Ongoing
26	--	Evaluate Impacts on Wet Weather Program	The Region is actively working with a major metropolitan sewer district to consider green infrastructure components in CSO Long Term Control Plan.	Ongoing
28	--	Continue Implementing the Sustainable Infrastructure Initiative	Region 5 has been raising awareness of water and wastewater infrastructure needs and promoting practices to ensure that water and wastewater infrastructure is properly operated and maintained.	Ongoing
--	29	Develop and Expand Emergency Response Training, Tools, and Exercises	Region 5 is promoting water conservation as part of the overall water security and resiliency messages to utilities and their customers and is assisting utilities in developing and launching their state WARN.	Ongoing
41	43	Maintain the NWP Climate Change Workgroup	Region 5 has been and will continue to be an active participant on the workgroup. The region also regularly participates in the monthly national climate change sub-lead calls.	Ongoing

Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
<b>REGION 6</b>				
8	<b>5</b>	Finalize Geologic Sequestration Regulations	Region 6 has been, and will continue to, build the technical expertise for GS of CO <sub>2</sub> , and will continue to actively participate in developing and commenting on the CO <sub>2</sub> geosequestration rulemaking, scheduled for completion in late 2010. Region 6 also conducts CO <sub>2</sub> geosequestration training, for water managers to ensure the protection of groundwater.	Ongoing
22	<b>17</b>	Expand Climate Ready Estuaries Partnerships	States in Region 6 are already affected by sea level rise, land subsidence and coastal land loss, and Region 6 is actively working to address this issue. Work continues in Region 6 to complete engineering designs & construct barrier island restoration & diversion projects; develop site-specific NEP restoration/adaptation project alternatives; and provide technical & planning assistance on high profile interagency restoration/adaptation policy and scientific evaluations.	Ongoing
39	<b>41</b>	Conduct Outreach to Partners and Stakeholders	Region 6 created an inventory of climate change mitigation and adaptation efforts with initial focus in coastal Texas and Louisiana to help leverage EPA's science priorities and complement the investments being made by other key stakeholders. Additional states will be added to the inventory and web-based and GIS tools will be developed.	Ongoing
<b>REGION 7</b>				
1	<b>1</b>	Improve Energy Efficiency/Reduce Energy Use at Water and Wastewater Facilities	Region 7 is working to improve energy management and water conservation by promoting the WaterSense program, promoting green infrastructure, and supporting carbon sequestration research and development.	Ongoing
28	--	Sustainability	Region 7's adaptation activities will focus on source water protection, sustainable water infrastructure, and wetlands protection.	Ongoing
<b>REGION 8</b>				
1	<b>1</b>	Improve Energy Efficiency/Reduce Energy Use at Water and Wastewater Facilities	Reduce energy use by water utilities.	Ongoing
2	<b>2</b>	Implement the WaterSense Program	Prepare for a water-constrained future.	Ongoing
--	R8-1	Adaptation	Promote water efficiency/conservation in the agriculture sector.	Ongoing
--	R8-2	Adaptation	Ensure climate change is adequately addressed in NEPA reviews, especially as they relate to water projects.	Ongoing

Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
<b>REGION 9</b>				
1	<b>1</b>	Improve Energy Efficiency/Reduce Energy Use at Water and Wastewater Facilities	Region 9 mitigation activities will include delivering a final Energy Management Workshop to Nevada and delivering 20 webinars to workshop attendees interested in working with EPA reduce energy use. Region 9's Biogas multimedia workshop will continue to explore regulatory, technical, and financial advancements to increase the use of biogas.	Ongoing
2	<b>2</b>	Implement the WaterSense Program	Region 9's "Cities for Climate Action" initiative will use the WaterSense program to increase water efficiency. We will work to secure additional WaterSense partners through our infrastructure grants and distribution of program materials.	Ongoing
3	--	Water Conservation at Drinking Water Facilities	Region 9 will seek to implement water conservation program working through NEPA on infrastructure grants.	Ongoing
4	<b>3</b>	Develop Water Resource Management Tools	Region 9 will continue to promote water leak detection through workshops and follow-up workshop webinars.	Ongoing
5	<b>4</b>	Assess Water Reuse	Region 9 will continue to maintain the only EPA website dedicated to water recycling and respond to public inquiries about the topic.	Ongoing
6	R9-1	Federal Agency Water Conservation Guidance	Region 9 will continue to implement its EMS program and coordinate with other Federal agency funding program to reduce water demand on the California Delta.	Ongoing
7	<b>14; 22</b>	Promote "Green Buildings" for Multiple Benefits; Promote Green Infrastructure for Multiple Benefits	Region 9 is coordinating with DOE to assist in implementing green building programs to reduce waste, water pollution and to promote water and energy conservation.	Ongoing
8	<b>5</b>	Finalize Geologic Sequestration Regulations	We will continue to participate on the Geologic Sequestration Regulatory process.	Ongoing
22	<b>17</b>	Expand Climate Estuaries Partnerships	We will continue to work with the San Francisco Estuary Partnership as a Climate Ready Estuary and assist Santa Monica Bay in developing their CRE project.	Ongoing
23	<b>18</b>	Continue Coral Reef Protections	We will continue to be active in the US Coral Reef Task Force and Pacific Islands to implement Local Action Strategies to reduce climate change and pollution threats to reefs.	Ongoing
7	<b>14; 22</b>	Promote "Green Buildings" for Multiple Benefits; Promote Green Infrastructure for Multiple Benefits	We will assertively and consistently include clear, enforceable provisions for low impact development.	Ongoing
--	R9-2	Adaptation: Integrated Regional Water Management Handbook	Region 9 is working to develop an adaption tool, a decision handbook for use by the California Integrated Regional Water Management Program. The handbook would guide local communities in incorporating a climate change into their water management plans.	Initiated

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30	25	Use the Clean and Drinking Water SRFs to Support Eligible Projects to Address Adaptation to Climate Change	We will continue to encourage SRF projects that support adaptation to and mitigation of climate change.	Ongoing
--	37	Coordinate Research Forum with ORD, Other Federal Agencies, and Industry/Utility Research Groups	Region 9 is working to jointly host a west and east coast conference on climate change research needs.	Ongoing
39	41	Conduct Outreach to Partners and Stakeholders	Region 9 is working with selected cities to deliver EPA programs that can reduce climate change impacts.	Initiated
<b>REGION 10</b>				
1	1	Improve Energy Efficiency/Reduce Energy Use at Water and Wastewater Utilities	Region 10's Sustainable Infrastructure (SI) Team is partnering with OR ACWA, BPA, OR Energy Trust, Region 10 PEER Center and others to work with 13 wastewater utilities to reduce energy use and increase efficiency. They will implement the Energy Management Handbook, use benchmarking to measure progress, and learn about techniques to improve efficiency, how to integrate climate change, communicate internally and externally, and available financing incentives to ensure a successful approach to reducing energy use. The SI Team will conduct Train-the-Trainer sessions in Energy Management Systems and Asset Management to water and wastewater technical assistance providers.	Ongoing
2	2	Implement the WaterSense Program	Region 10 is promoting the WaterSense Program and water conservation in general through a wide range of activities. The Region continues to recruit WaterSense partners by distributing outreach materials, taking calls from media or from potential partners, and by doing presentations and booths at various events. The SI Team will conduct Train-the-Trainer sessions on WaterSense to water and wastewater technical assistance providers.	Ongoing
22	17	Expand Climate Ready Estuaries Partnerships	Puget Sound and Lower Columbia River have been selected to receive funding to embark on the CRE Program.	Ongoing
7	14; 22	Promote "Green Buildings" for Multiple Benefits; Promote Green Infrastructure for Multiple Benefits	Region 10 has a new position to incorporate LID in the stormwater permits it writes to demonstrate how it may be done in the Pacific Northwest. The position will provide technical assistance to communities in Region 10 with a special focus on the Puget Sound Basin.	Ongoing
30	25	Use the Clean and Drinking Water SRFs to Support Eligible Projects to Address Adaptation to Climate Change	Region10 will work with its states to identify potential actions that encourage communities to use the Clean Water and Drinking Water SRF to fund actions to prepare for the impacts of climate change (adaptation) or engage in mitigation projects.	Ongoing



Old KA #	New KA #	KA Title	Description	2010-2011 STATUS
39	41	Conduct Outreach to Partners and Stakeholders	Region 10 will continue to participate in regional Climate Change workshops and conferences as time allows.	Ongoing
41	43	Maintain the NWP Climate Change Workgroup	Region 10 will continue to participate in the OW Climate Workgroup. Region 10 also has its own regional internal Climate Change Network, whose members share information on their climate activities and news.	Ongoing
44	46	Coordinate with other Federal Agencies for Climate Change Mitigation and Adaptation	Region 10 holds regular meetings of the Climate Change Collaborative, a workgroup of the Federal Agencies located in the Pacific Northwest. The purpose of this group is to better integrate, organize and focus the Federal community's efforts in addressing the challenges posed by climate change in the Pacific Northwest. C <sup>3</sup> meets regularly, approximately monthly via teleconference and bi-annually via videoconference.	Ongoing



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